Air Age Publications

48120 July 1987 $2.95

MODEL AIRPLANE NEWS

...INE Canada $3.75

Texan Fever!

Helicopters: Learning to Hover

Goldberg's Electra Glider

Operating Your Four-Stroke Engine

0 71896 48120 07

MODEL AIRPLANE NEWS

ON THE COVER: The six air show performers, Six of Diamonds, are sponsored by The Cookpit Catalog. From the bottom, they are Bill Dodd, Chuck Kruger, Pete Vandersluis, Danny Dameo, and Terry Walbrun—shot at Titusville, Florida, at the Valiant Air Command Show, an event that didn't escape the expeditious eye of Budd Davisson. Read about the tin-can Texan on page on page 20.

ABOVE: Sheri Smothers pleasantly poised amid Texas bluebonnets, the state flower. The Carl Golberg Electra she's holding is reviewed on page 60.

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

Model Airplane News (ISSN 0026-7295) is published monthly by **Air Age, Inc.**, 632 Danbury Rd., Wilton, CT 06897. Second class postage paid at Wilton, Connecticut, and at additional mailing offices. Subscription rates are $25 for 1 year (foreign $33), $47 for 2 years (foreign $63), $65 for three years (foreign $89). **Postmaster:** Send Form 3579 to **Model Airplane News**, P.O. Box 428, Mount Morris, IL 61054.

MODEL AIRPLANE NEWS
The world's premier R/C modeling magazine

SUBSCRIPTION PRICES:
U.S. & Possessions (including APO & FPO): 1 year $25.00; 2 years $47.00; 3 years $65.00. Outside U.S.: 1 year $33.00; 2 years $63.00; 3 years $89.00. Payment must be in U.S. funds.

MODEL AIRPLANE NEWS is published monthly by Air Age, Inc., 632 Danbury Rd., Wilton, CT 06897. Connecticut Editorial and Business Offices, 632 Danbury Rd., Wilton, CT 06897, phone 203-834-2900. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Y.M. Micik, Treasurer. Second Class Postage paid at Wilton, Connecticut, and additional Mailing Office. ISSN No. 0026-7295.

CONTRIBUTIONS: To authors, photographers, and people featured in this magazine, all materials published in *Model Airplane News* become the exclusive property of Air Age, Inc., unless prior arrangement is made with the Publisher, in writing.

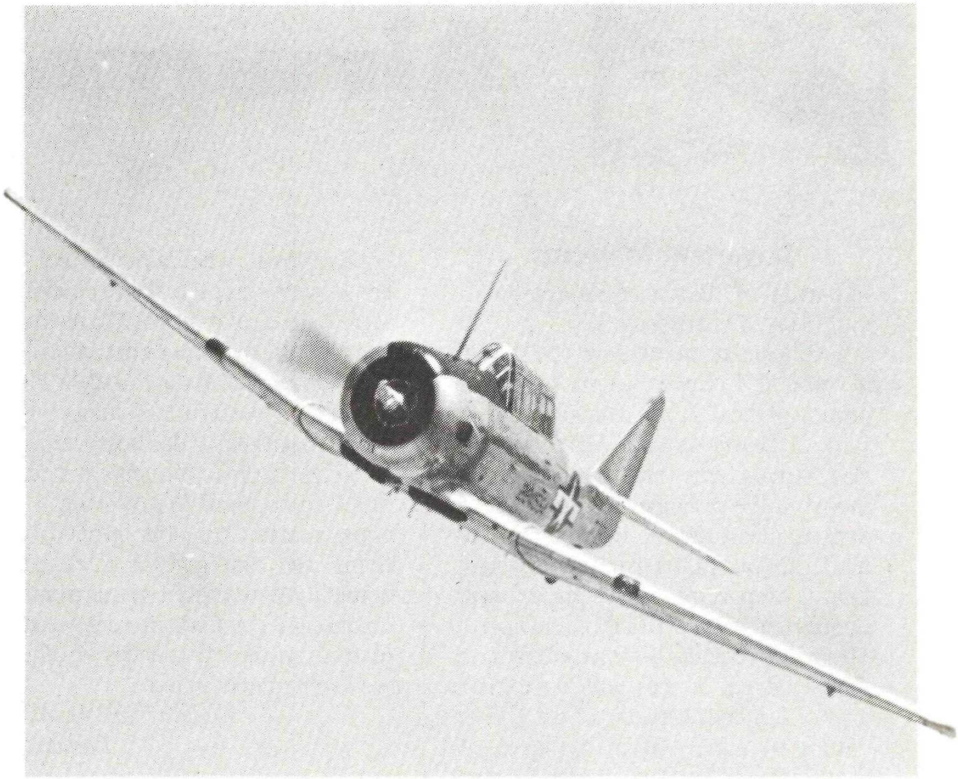
ADVERTISING: Advertising rates available on request. Please send advertising materials, insertion orders, etc., to Advertising Dept., Air Age, Inc., 632 Danbury Rd., Wilton, CT 06897, phone 203-834-2900.

CHANGE OF ADDRESS: To make sure you don't miss any issues, send your new address to Subscription Dept., *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide the extra postage. Duplicate issues cannot be sent.

POSTMASTER: Please send Form 3579 to *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054.

Editorial

by LOUIS V. DeFRANCESCO, JR.



MANY OF YOU who have been long-time readers of *Model Airplane News* will immediately recognize the neat little .15-powered T-6 Texan gracing this month's center spread. It is unquestionably the number one selling construction plane that we have ever featured. But why the revival? As more and more flying fields are lost, the demand for smaller R/C airplanes increases, not to mention that there are thousands of newcomers to radio control modeling who would love an easy-to-build, super-flying, smaller sport-scale airplane. At least once or twice a year we will reprint a once-very-popular aircraft construction article for all the newcomers to our great hobby.

In keeping with my earlier commitment to accommodate the R/C helicopter modelers with more articles, we have one on hovering by the good doctor himself, David Trost, a slick review on the Hughes 300 from Gorham Model Products, and of course our monthly column by our resident helicopter pundit, Craig Hath. We are very aware of the accelerated growth and interest in radio control helicopters.

I have been in contact with some of the R/C industry "heavyweights" and four-stroke engine sales are still very strong despite rumors of dwindling demand. It seems a large segment of the modeling community swears by them so we have featured a two-part series on operating four-strokes by the world's number one small engine expert, Peter Chinn.

Radio Control Modeling is growing in leaps and bounds and the hobby is becoming quite diverse. With each issue we try to cover a broad range and I know there is something in this issue for all involved.

Happy flying! ■

Airwaves

Important Moments

In part IV of "Basics of Scratch-building" (May '87 issue, page 28): "...weight is weight and no matter how you slice it, if you add 4 ounces weight to the aft portion of the CG, you'll have to add the same to the fore section." Of course, this isn't strictly true and that it is the moment, the distance from the CG or datum, measured in inch-ounces for model aircraft, rather than simple weight that is important. A weight of four ounces in the tail with a moment arm of 10 inches equals 40 inch-ounces. It would take 8 ounces with a moment arm of 5 inches forward of the CG or datum to equal 40 inch-ounces. A modeler building from scratch the first time, having previously built only from kits that told him or her where to put each item, might fail to realize this unless it is pointed out. Otherwise, thank you for a very informative series as well as thanks to the entire staff for an excellent publication.

FRED E. BELLOWS
Sharon, MA

You're absolutely right, if one were to place the weight at the very tail end. However, Dan was speaking about placement of radio gear within the space associated with the wing opening and around the CG; therefore, the weight shifting here is within limited inches of the CG. The sentence probably should have read, if you add 4 ounces radio gear just aft the CG, you must then add 4 ounces weight the equivalent distance forward, with all other things being equal. *AS*

Bird's-Eye View

In 16 years of active R/C modeling I've met several narrow-minded individuals who feel that their special interest is indeed best for everyone. It is a shame that these few are responsible, in some cases, for actually discouraging overall hobby growth when a newcomer happens to cross his path. It is my belief that there's plenty of room for all and that we can all learn and gain from each other. If I want to read all about full scale, I'll buy one of the special-interest mags, which I do on occasion. I do, however, relish Budd Davisson's comments and detailed flight descriptions that provide a welcome respite from our ground-based flying and that give us a chance to actually *feel* the flight of our miniature creations. Keep Budd in. And we can all learn from the experiences of others if we keep an open mind.

TERRY TERRENOIRE
Endicott, NY

Soaring News

I've recently become interested in R/C gliders and so each month I scan your mag for info, which I find only in "Soaring News." However, I didn't find this column in the December issue. I would be very interested in an article on flying for the intermediate pilot on such topics as aerobatics and finding thermals. I'd also like to see "Soaring News" again. Thanks.

TOM REYNOLDS
Fairfield, CT

Pressure on magazine space is solely responsible for the exclusion of "Soaring News" from the December issue. However, "Soaring News" will appear on a regular basis in the future. Thanks for expressing your interest—we love the input. *Staff*

Microwave Mystery

I thought this might be an interesting story for your readers. One day I was cycling my batteries and was carrying my models up to the kitchen so that I could keep an eye on my power pacer to see if the charge cycle had started. I had a Calypso with a Futaba radio and a 1,000-mAh pack in it. Nothing was hooked up yet and I know that both the transmitter and receiver switches were off. I went over to pop some popcorn in my microwave oven and the servos went crazy! Just like when you range-check and walk away too far. I immediately turned the oven off and grabbed the transmitter to see if I had accidentally left either switch on. I hadn't. I turned the microwave on again, and it happened again. The fuselage was about 6 feet from the oven. I know the microwave puts out energy, but it also must put out some kind of voltage since the receiver switch was off and no voltage was getting to the servos. Just thought it would be interesting to see if this had ever happened to anyone else.

TIM KARRER
Worthington, OH

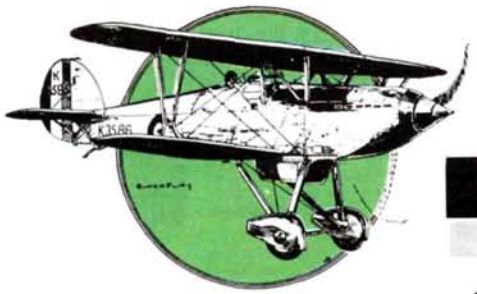
Okay, guys, you tell me about this one. Has anyone else ever had this happen? If so, do you have any answers? *CC*

One Cloudster

The April '87 issue of *Model Airplane News* "Name the Plane" contest featured a prototype, and only version ever built, Douglas Cloudster. The very same plane was given to me and my airscout troop in 1956 by Douglas Aircraft at Santa Monica, California. The Cloudster had twin engines driving a single prop. I have her original certificate of airworthiness, too. If anyone would like to know more about this plane, let me know.

RICHARD MERRICK
3571 Schaefer St.
Culver City, CA 90230

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," Model Airplane News, 632 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length.



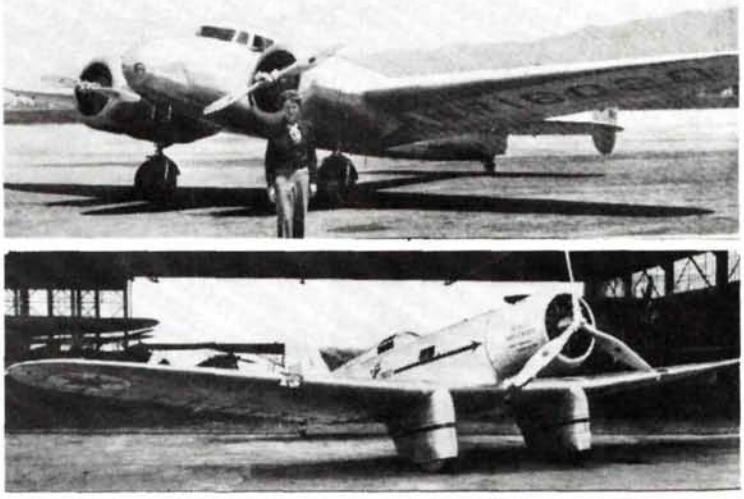
Fifty Years Ago

by ART SCHROEDER

The Joe Kotula cover recognized that biplanes were still dominant; but the monoplane was coming.

JULY 1937's *Model Airplane News* featured a fascinating article by Lt. H.B. Miller, "So You Want to Break a Record?" The piece covered difficulties in extending flight records in full-scale aviation. It was most appropriate in this early era when airplanes were pushed higher, farther, and faster by the efforts of such notables and aircraft as Howard Hughes with his Hughes Racer, Captain Frank Hawks and Time Flies, Roscoe Turner, and Amelia Earhart with her Lockheed Electra. Records were falling each month, particularly on American coast-to-coast flights. Robert C. Morrison in "Frontiers of Aviation" continued the record reporting with coverage on Rudy Kling's newest racer powered by a 260-hp Menasco. Also mentioned were Harry Crosby's efforts to break Hughes' landplane speed record, Roscoe Turner's new Bendex Thompson racer, and the recovery of Benny Howard after an earlier near disastrous crash. Speeds were running around 350 mph—seems slow compared to today's "multi-mach" fighters but, for 1937, this was torrid aviating!

It's interesting to note that early issues of *Model Airplane News* combined full-scale aviation and modeling very effectively and that continues today.

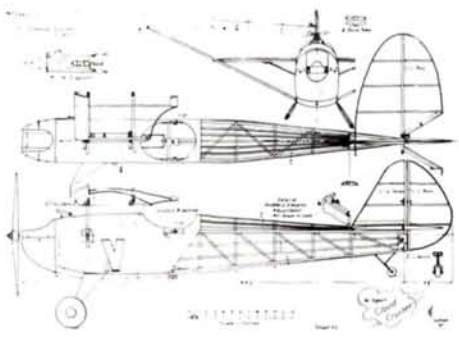


Above: Amelia Earhart and her renowned Lockheed Electra. Below: Frank Hawks' beautiful Northrop Gamma.

On the modeling front, a nifty Brown Jr.-powered parasol design appeared. Called Cloud Dancer, this slick airplane featured detachable wing halves, stabilizer, fin, and motor unit, which certainly made it easy to transport. The airplane was designed by Harry Moyer.

In 1937, full-size plans were not offered by *M.A.N.* However, most modelers were capable of enlarging plans, an art that has, unfortunately, been largely lost today. There was a real satisfaction to developing building lines on brown wrapping paper (or whatever one could obtain) and the process made one feel a bit more creative. Indeed, many developed a real skill that carried over to careers in design and drafting.

William Wylam and his fantastic aircraft engineering drawings have been known to modelers for decades. He remains one of *M.A.N.*'s most popular authors through various books by the master draftsman. The July 1937 issue contained Wylams three-plate series on the Curtiss Hawk III-C. Little-known parts of those early Wylam's were the instructions he added to make a wooden shelf model from his drawings. Many superb static models were built as a result.



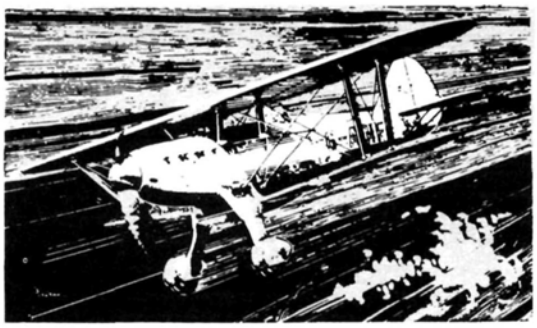
Feature construction article was the fine-looking crowd pleaser by Harry Moyer.

Even a model airplane kit was offered as a subscription premium; 12 issues and a kit for a buck.

Times do change. *Model Airplane News* was offering a 12-issue subscription for one buck, including a kit for a flying model of a WACO C biplane. This was quite a bargain then and spectacular in today's market.

But times continue to change. *M.A.N.* had a design contest in July 1937 for rubber-powered speed airplanes. Top prize was $20, second got $12, and third took $7. Compare that to our present design contest with its $2,000 first prize.

Fifty years ago model airplanes were as fascinating and challenging as they are today and *Model Airplane News* continues with the story. ■



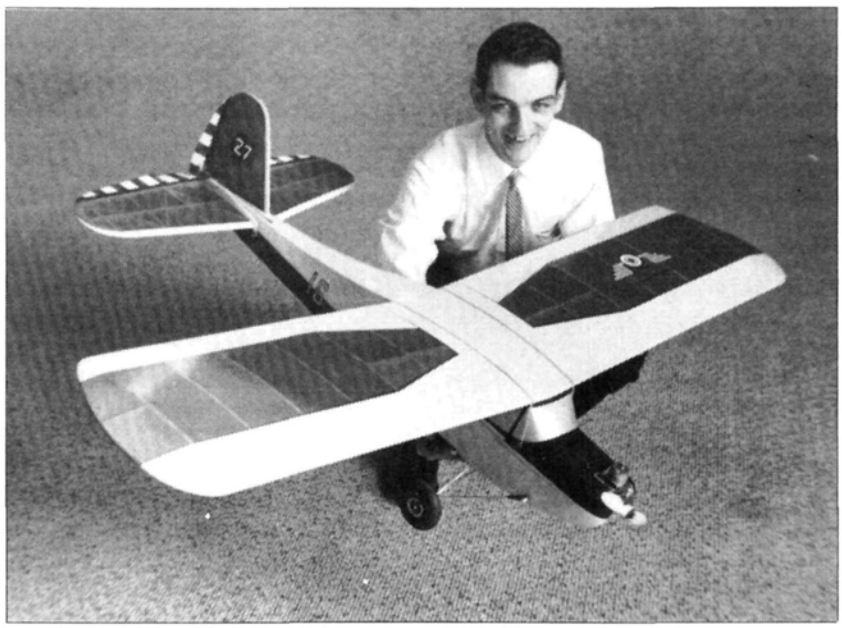
Golden Age o

by HAL "PAPPY" deBOLT

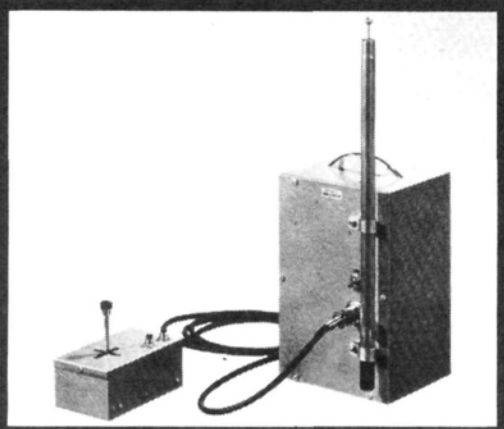
THIS SERIES covers the life span of radio control. During R/C's pioneer days a modeler could make the now little-known solid models and perhaps was able to achieve short flights with rudimentary rubber power. Rubber power improved, then with the advent of the Brown Jr. and gas power, "free flight" exploded. Jim Walker's U-control created the ability to have practical model aerobatics and speed flying. However, dreams of ultimate model flight remained dreams until the promise of R/C was fulfilled. Are we now at the apex of modeling? It seems so. This period would seem to be modeling's heritage and many of R/C's senior citizens can cherish it.

The name Bramco is surely synonymous with Richard "Dick" Branstner. We lost Dick at a much too early age, but his imagination and devotion to perfection made their mark on our hobby. This man's vision and inspiration made molehills out of mountains. If there was one shortcoming, it was the Detroit atmosphere in which he was involved. Dick envisioned R/C developing with the grandeur of the auto industry.

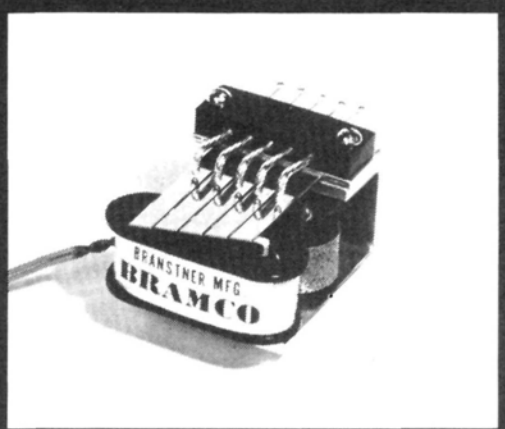
His enthusiasm took radio control far beyond model aircraft. In the mid-'50s the big thing was to set world speed records with powerboats going 200-plus mph. The problem was that a couple of wooden hulls had exploded at that speed. Alcoa Aluminum thought they had the answer with a metal boat, but what driver would dare find out? Through his interest in unlimited hydroplanes, Branstner learned of the problem. He offered to radio-control the boat and prove the concept, with no driver to be endangered. Branstner adapted the necessary equipment from his hobby gear. However, there was no powerboat driver with R/C skills, so Dick became the driver. As the story goes, the lake used for the tests had a narrow peninsula projecting into one end. Apparently the speed run was begun at the opposite end and Dick did get the boat over the 200-mph barrier, but in the process forgot about the peninsula. The boat literally took off when it encountered the peninsula.



A very young (weren't we all?) Tom McCoy and his 30% enlargement of the very popular Live Wire Champion. Photo is from 1958. Bramco radio and Fox .35 power.



The first Bramco five-channel audio transmitter and control box. Note it is single-stick.



The highly developed, efficient Bramco reed bank; exhibited quality design and construction.

Branstner also worked with General Electric on one of the "home show" exhibits. GE offered the "kitchen of tomorrow" as their presentation in one of these shows. The futuristic exhibit was to feature automatic cleaning and meal service with no human effort involved. Again Bramco provided the answer. Both the modernistic vacuum cleaner and service cart seemed to work on command. In reality they were powered from behind a two-way mirror, *a la* Bramco reeds.

I got to see the show when it was in Buffalo. Apparently there had been a problem during the first matinee when the serving cart left the exhibit and made its way through the onlookers (an "I ain't got it" situation). A frantic phone call from Detroit asked me to see what I could do to help out. Frankly, I was dumbfounded by the maze of relays and servos in that contraption. After much contemplation I came back to the first thought of any R/Cer of that day: by cleaning and adjusting the relays, the cart performed like a charm.

You probably operate your TV from the comfort of your recliner via a remote control. Would you believe we owe this luxury to the vision of Bramco? GE introduced the first remote control and Bramco produced it. The design was a projection of the basic Bramco reed system. The control box was a short-range transmitter with push buttons, not unlike the current style. The TV included a simple receiver associated with a Bramco reed bank switch to control the various circuits. It required a major expansion and production effort by Bramco to produce the controls in the needed quantities. Unfortunately, in a short time the electronic wizards of GE found a shortcut for the method.

This TV effort lead Bramco into the reed relay market with various types and styles which were soon leaders in that field.

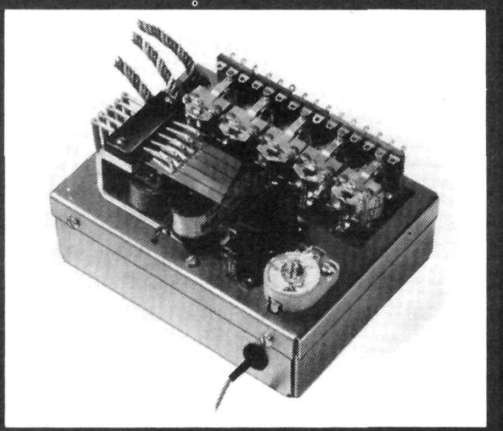
Bramco's contributions to the hobby industry are impressive as well. Branstner learned of a large university's investigation into resonant relays and so-called reed banks. When he studied the extensive technical report he saw that this major effort had found the basic requirements for ultimate performance. It's difficult to condense such a complete work, but the effort concentrated on performance only, and considered power requirements, electronic efficiency, and metallurgy. To Dick this was an opportunity to enter the R/C industry with a truly superior system, the reed bank being the heart of that day's multi systems. The Bramco corporation was formed and prominent people of the group were Branstner, Ernest Kratzet, George Vaugn, and an electronic whiz kid named Eric Von Volter. Their philosophy was quality and performance first, all else secondary.

Most reed banks required constant attention. For example, a half-turn of the No. 80 thread contact screw could upset the adjustment, probably because the basic needs of R/C did not allow enough power to drive the comparatively inefficient reed bank. The value of the efficient Bramco discriminator was that even low power was far more than was needed. For example, the Bramco reed contacts were factory-adjusted heavy silver wire with no maintenance required. The reed amplitude was so great that fine adjustments weren't needed. In use, the entire Bramco system seldom required any attention, much like today's radios. Happily Dick's penchant for quality was reflected in the rest of the system, which became acknowleged as the finest.

Visionary people are often characters and my first experience with Bramco was most unusual. I had read a media report about this new system and had placed an order. I then waited weeks for something to happen. My phone calls kept bringing the familiar "tomorrow delivery" promise. Finally I was told that I could come to Detroit and pick up my system, if I cared to. Of course I would.

I arranged the five-hour drive so I would arrive early in the morning. I

(Continued on page 84)



The first Bramco Blue Chip five-channel receiver, a later version was labeled the Regent.

Bramco also offered the Cardinal single-channel receiver that equaled reed performance.

Things You Should Know

Basics of Radio Control

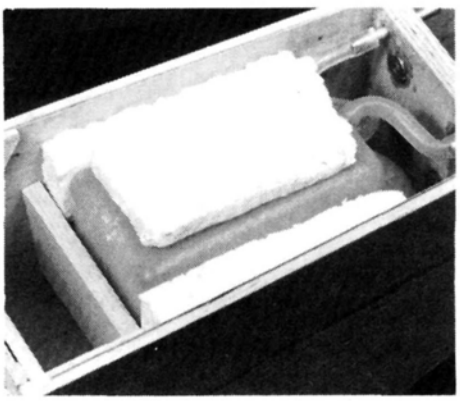
by RANDY RANDOLPH

HERE ARE a few tips that old timers know, but that are not always covered in the instruction manuals. Some of them relate to building and others are simply things that should be done to eliminate future problems. Most of these suggestions should become automatic, because experience has shown that they save time and trouble. Remember, these are just a few tips out of many.

First, all sandpaper is not the same. Just because the grit size of two pieces of sandpaper has the same number does not mean that they will do the same job. Use only garnet or aluminum oxide paper and make sure it says "open coat" on the back if you're sanding wood. Open coat paper is designed to release the sanding dust so the paper continues to cut, and good sandpaper does cut! Even the 400- and 600-grit papers will remove material efficiently.

Water-proof glue is different from water-resistant glue. Water-proof glue is supposed to withstand boiling water for a given length of time. Water-resistant glues withstand soaking in water for the same time period. Aliphatic resin glue sands better than cyanoacrylate and both are water-resistant. Model airplane cement, Ambroid or Testors, sands best of all.

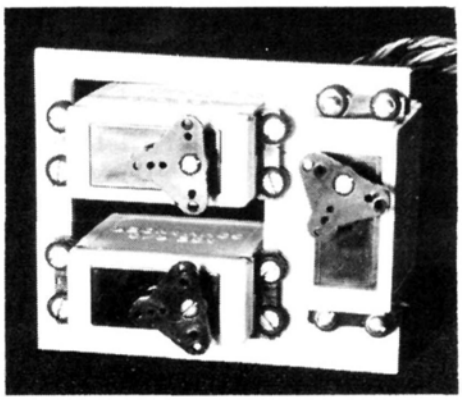
When drilling through balsa sheet, always back up the hole with another piece of wood or the back side of the hole will splinter. The sharper the drill, the better the hole. Balsa tends to adhere to a dull drill, resulting in an off-diameter, fuzzy hole. Large-size drills tend to hog out the soft wood rather than drill a smooth hole. Drill a smaller hole and finish it with a sandpaper-wrapped dowel.



Foam pads around fuel tanks secure them in place and help reduce fuel foaming.

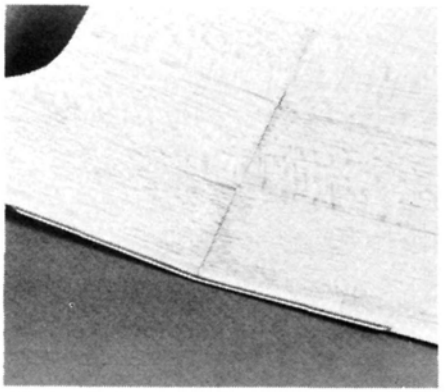
Fuel tanks that are wedged in place with foam tend to have less fuel-foaming problems. They are considerably easier to remove, or replace, should it become necessary. Fuel lines must be free of kinks, and even the tendency to kink. The smaller the tubing, the smaller the bend before kinking. Use some sort of strain relief between throttle arm and servo. Use epoxie glue in any area that might be exposed to raw fuel and to seal the seams of iron-on coverings near the engine and firewall.

Music wire epoxied to the trailing edge of wings at the center section keeps rubber bands from cutting into the wood. Cross wing rubber bands diagonally from side to side, rather than along the same side of the fuselage, to eliminate a shear line. After a flying session, shake oily rubber bands into a can of cat litter to restore them for future use. Paint wing-holding dowels with epoxy paint to eliminate exhaust saturation.



Servo grommets should be checked often and replaced before they become too firm.

Replace all servo grommets regularly because they become hard and useless after a time under compression. Mount servos with broad head screws or with washers against the grommets. Recharge all batteries after every flying session and then again before the next. Check receiving antennas for abrasions where they exit the fuselage and repair with heat-



Music wire inserts at wing center-section T.E. keep rubber bands from damaging wood.

shrink tubing if necessary.

When setting up control linkages, remember that more force is applied to the surface when the servo pulls it rather than when it is pushed. Anchor Nyrods every 6 or 7 inches along their entire length and have the exit as close to the control horn as practical to eliminate as much flexing as possible. Use the rubber sleeve that comes with clevises to secure them in control horns. Wiggle all control surfaces by hand to check for any slop that might cause flutter; correct if necessary.

Check your prop for hair-line cracks or chips, replace it if any are noted. Before starting the engine, look behind your airplane to see if the slipstream or exhaust would harm a fellow flier or his equipment. Check control response before every flight, and after each flight wipe the exhaust residue from the airplane and cover the engine. At the end of each session clean all of the exhaust residue from the airplane with one of the spray window cleaners and a paper towel. Clean the engine and apply Marvel Mystery Oil or automatic transmission fluid to the intake and exhaust ports, turn the prop to work the oil into the engine, and cover the engine before storage.

Don't be afraid to ask for help! The only stupid questions are those that are never asked....

Randy Randolph, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

DUKE'S MIXTURE

It has been a rather traumatic experience learning how to cast hyper-eutectic alloy (pistons for ABC cylinders), learning how to prepare brass liners for chrome plating, and how to drill a straight hole for a wrist pin retaining pin all at one time. One thing we found out is that hard chrome is a different breed of cat from polished chrome. True hard chrome can hardly be touched with ordinary honing stones. You have to use either Borizon or diamond if you want to make any impression on it. Of course, this has its bright side. A surface that hard is not likely to ever wear out. The pistons used successfully with chromed brass liners must be of one of the hyper-eutectic alloys to have any really long life. Our attempts with alloy 380, 384, and bar stock aluminum produce an engine that was good for a few runs, but just didn't last. Also, they expanded too fast. Alloy 390 was the winner. It is almost as hard as Vanasil and can be machined where Vanasil is practically unmachinable. Besides, Vanasil has become virtually unobtainable on today's market. We are now die casting the pistons for our ABC motors, and this required learning a whole new bag of tricks on how to cope with an alloy that shrinks on a core so tightly that you would think it was welded on. Any reasonable size ejector tabs just break right off. Anyway, we now seem to have it under control, and I am quite pleased. For you who have handled and flown our new Delux, you will be impressed by how smoothly the motor runs and how remarkably good the cranking compression is. Unlike most of our competitors, we do not use a straight tapered sleeve. Instead, our sleeve is shaped in a manner we feel gives us better compression, quicker starting, and generally more satisfactory operation.

I have wondered why so many brand X motors with ABC set-up failed the first few runs. It is now clear. You start the motor — and immediately give it full power. The piston heats up faster than the cylinder liner — and the slightly sticky piston suddenly is real tight in the top of the cold cylinder — so tight, in fact, that the rod is not strong enough to pull it down. If the inertia of the prop and spinner is enough, the rod fails in tension. Moral — flight instructors of full size airplanes know what they are talking about with they say, "Avoid rapidly heating or cooling your motor."

Our 40 Delux is less sensitive to this problem than most because our liner has more stretch than most.

Work is well along on our new 45 engine. The new model will be available both with the ring piston-steel liner, and with the ABC configuration. The ABC is expected to run slightly faster, but will cost more. The new version features a larger wrist pin, and uses a rollpin instead of those troublesome wrist pin snap rings. Also included is a die cast aluminum spinner and a completely new muffler. The newest version will have even more power than its predecessor, and is quieter running.

As far as I know, it has been 25 years since any U.S. manufacturer has manufactured a die cast spinner. As you have seen, our 40 Delux is equipped with one. The nature of the alloy used is such that it won't polish up like our bar stock spinners do. However, the general configuration is the same. The tooling has been made very accurately so the spinner runs true and is well balanced. The spinner itself is bead blasted to accept the paint of your choice.

Regarding our coming Quickie 500 motor, we have been working with both our compact frame and our 45 frame. At this point, it looks like our 45 frame is going to be the winner. I wonder if it is just coincidence that a Rossi 40 Cyl. will slip into our 45 case (a Rossi 15 piston fits our 15 Cyl. also).

Attention, club officers! We have set aside ten Fox 40 Delux's to be given away to power club trainers. If your club has a trainer with a tired 35-40 size motor, give us the word quick, and if you are one of the first ten, we will send a new 40 Delux at no charge. We would want some assurance that this will be used for training purposes, however.

For those interested, we now have a short adapter nut that will fit a 2" machined spinner to our Eagle and other motors with a 5/16" shaft. Heretofore, the 2 1/4" was the smallest that would fit on the larger motors. Ask for part #60408. The price is $1.50. Also, we have resumed manufacturing our machined from bar motor mounts, and have sizes in stock that will fit most motors from 29 through 60 size.

Do you want your airplanes to fly better? Well, the quickest way to improve model performance is to build it lighter. Many models that I see flying could have easily been 20% to 25% lighter, and still be as strong, or stronger, had a little attention been given to the structural design. A built up balsa and spruce wing utilizing a D tube construction and zig zag ribs aft of the spar can be stronger, stiffer, and weigh one half of what most foam wings do. Likewise, a fuselage, planned to tie the motor loads through the front section and into the landing gear section, can be a great deal lighter than most are today. Someday, if I have time, I would like to develop a full grown article on some of these structural concepts, but I probably never will take the time.

Out of space. Happy flying, you-all.

Duke Fox

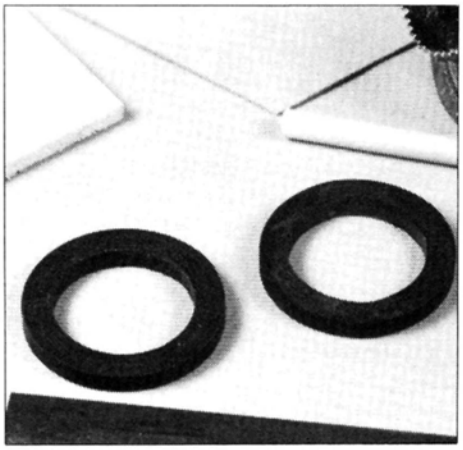
FOX MFG. CO — 5305 TOWSON AVENUE
FORT SMITH, ARKANSAS 72901
PHONE (501) 646-1656

How To:

by RANDY RANDOLPH

MAKE LIGHTWEIGHT WHEELS

With the exception of gliders and sailplanes, just about all R/C airplanes need wheels. Excellent wheels are available from a number of manufacturers and fill the need admirably. But the wheels described here have two things going for them: they are very inexpensive and very lightweight!

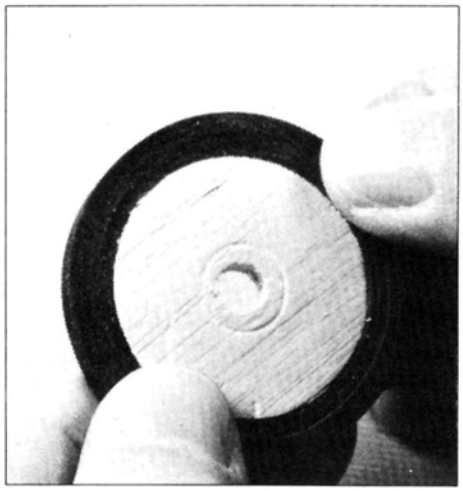


1.

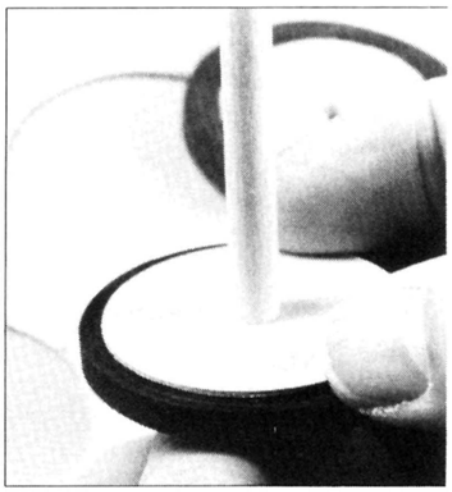
2.

1. The tools and materials needed include an inexpensive multi-size hole saw, a razor saw, a 1/8-inch drill, 3/16-inch sheet balsa, 1/32-inch plywood, some 1/4-inch hardwood dowel, a short length of 1/8-inch brass tube, and two heavy-duty slip-joint 1 7/16 i.d. washers (available from a plumbing supply house).

2. Saw two disks from the 3/16-inch balsa sheet with the 1 1/2-inch hole saw. The disks will be round and have a 1/4-inch hole in the middle of each.



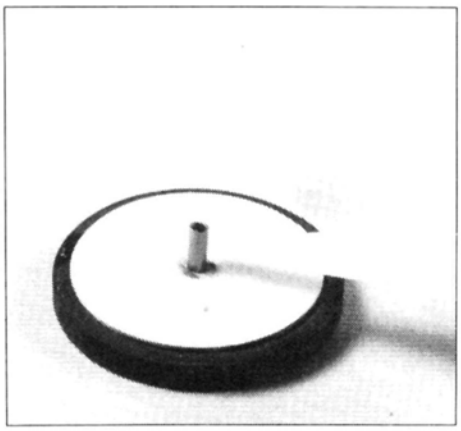
3.



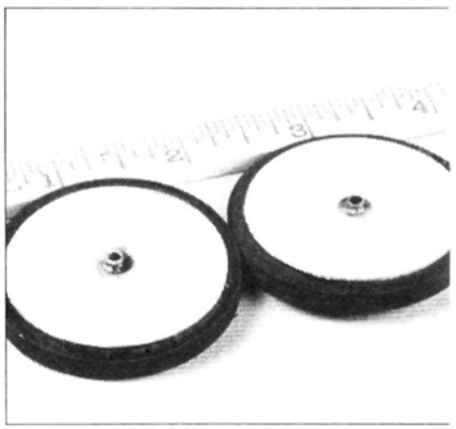
4.

3. Slip the washers over the balsa disks as shown. They will stretch a little and give a good, tight fit. The washers are 3/16-inch thick, so they fit flush with the sides of the balsa disks. Apply cyanoacrylate glue to the washer/balsa joint.

4. Cut four more disks from 1/32-inch plywood, using a 1 3/4-inch hole saw. Apply slow cyanoacrylate and make a sandwich with the plywood on both sides of the balsa disks. Line everything up with a piece of 1/4-inch dowel through the center hole.



5.



6.

5. Trim the dowel flush with both sides of the wheel, then drill the center with a 1/8-inch drill. Glue a piece of 1/8-inch brass tube through the center hole. This will match a 3/32-inch landing gear wire. Use bigger tubing for larger wire.

6. File the brass tubing so it extends about 1/32 inch on each side of the wheels, and the finished products are then ready for paint. These 2-inch wheels weigh 1/4 ounce apiece.

Tin-Can Texan

T-6 TEXAN

WHAT TAKES LONGEST WHEN painting a room in your house? For some of us, it's putting the papers on the floor, which seems to take forever because interesting bits of news keep popping out, begging to be read. So it takes an hour instead of just five minutes to lay the paper.

That's why it takes me so long to type stories about airplanes like Texans. Every time I go to check a fact or find a serial number, I stumble across dozens of little anecdotes.

I could live to be a thousand and never tire of reading about airplanes and their history. The lowly North American NA-16 Texan is one of those airplanes. In fact, it may be a one-of-a-kind critter—it has probably trained more pilots, done more interesting, gruesome, and boring jobs than any other airplane; and it's played more characters in the movies than Lon Chaney.

Exactly where would Hollywood be if it weren't for T-6/SNJ Texans? We've watched them bomb the young Kennedy kid in *PT-109* and strafe beaches in every war movie that had water. With suitable surgery, they were very, very convincing Zeros in *Tora, Tora, Tora* and there isn't a national insignia that hasn't been painted on her sheet-iron flanks. The only thing she hasn't played is a Spitfire or a BF-109. Even movie moguls know that the public isn't that blind.

Anyway, in sorting through the pictures and stats to tell a tall Texan tale, I couldn't help but wonder at the amazing amount of stuff that is available on Texans, but poorly detailed models still keep popping up. If there is one airplane that can be documented, the T-6 is it. Oh sure, there are Mustang and P-40 books, but the T-6 has left a pretty healthy paper trail behind her for the modeler. One of the better books on the subject is *Pilot Maker* by Jeff Ethell and Walt Ohlrich (Specialty Press).

Right now, I'm going to give you information that every scale modeler in the free world should have, the address and phone number of Air Service Caravan. This is the single biggest repository of important documentation you'll find. No, they don't have posters and picture books. And they aren't going to help you with garish paint schemes. What they do have, and what they can do, is give you the same pilot and

article and photos by BUDD DAVISSON

technical manuals the military had when they were still flying and maintaining the old birds. Air Service Caravan specializes in reproducing manuals for some of the damndest things you've seen...like Messerschmidt 109s and 410s. As of today, you can drop about $17 on them and get flight manuals for AT-6A, B, C, D, F, G, BC-1s. Those will give you complete cockpit layouts as well as accurate three-views on most models of the old Texan. And there were a lot of different models. If you really want to get into the nitty gritty of details, they have parts manuals about the size of the Manhattan phone book for $30.50. They illustrate every goody in the Texan. They also have maintenance manuals that not only give details that even Dave Platt would have to ignore, but with one of these in your back pocket, you can sit down and overhaul your T-6 in the street should it break down at a stop light.

Over and above the T-6/SNJ, any modeler should have Air Service's catalog stuffed in a cranny above the work bench. If they don't have a manual for it, it doesn't deserve to be modeled. Oh, I almost forgot. It is Air Service Caravan, Municipal Airport, New Bedford, MA 02747. But even the vast library of Air Service can't cover the tremendous range of models that comprise the Texan's history, especially if the first models are included.

At 170 mph they'd pump rockets into the target....

The original NA-16 of 1935 hardly looked like a Texan because it was a relatively normal low-wing, fixed-gear, open-cockpit airplane with a fabric fuselage and metal wings. The military liked the bird but opted for some changes, including the now-familiar long, two-place greenhouse canopy. The first major production model of the series, the BT-9, looked like the Texan we all know so well. But, it was a basic trainer with fixed gear and fabric fuselage. BT-14 was next and was essentially a cleaned up BT-9. Then someone, somewhere, said, "Let's hang a 550-horse R-1340 on it, retract the gear, and see what we get." What they got was the AT-6 Texan and what they started was a trainer dynasty that would last for over twenty years.

The official start of the AT-6 series was with the BC-1A. To identify one of the old birds today is a good trick, since very little changed, visually, as the series wore on. However, the BC-1A and the Navy's SNJ-1s and -2s can be picked out because they are the only Texans with a rounded, rather than a triangular, rudder. Other than that, you have to have sharp eyes to pick out one model of Texan from the next.

Certainly a few of the changes are noticeable. For instance, the canopy side panels of the later USAAF airplanes, especially the "G" models, eliminate one of the


284
RCAF
284

bars, giving better visibility. The Canadian-built Harvard Mk. IVs carry the canopy clean-up one step further by putting one-piece glass in the overhead panels. As if trying to be a little different, the T-6F and the SNJ-6 have totally different rear canopy structures in that they are formed, one-piece Plexi units with no framing whatsoever. In truth, the F model glass and the rounded rudder outline are about the only visual indications of which model is which.

If you want to throw details in that will drive a Scale judge bonkers, how about this one: most, if not all, Harvards have long exhaust stacks with big heater muffs on them extending down the right side of the airplane. Almost all American Texans were built to accommodate this heater, but practically none of them were ever installed. However, just in front of the exhaust stack on the right side of every T-6/SNJ is a half moon patch in the edge of the cowling to give clearance for the big heater muff that was never installed. So, one guy's job on the assembly line was to cut a half moon notch in the cowling and further down the line another guy was making patches to replace the half moon!

Another seldom-seen detail is the gunnery provisions on the airplanes. Only the T-6G, SNJ-1 and -2 and the BC-1/AT-6A series lacked a gun port in the cowling. The notch is quite noticeable. What is even more noticeable to an alert Scale judge is the cutout in the front instrument panel. The rear of the Browning's receiver stuck part way through the instrument panel and the pilot could charge it manually by grabbing the cocking handle. Bear in mind, however, that very few of the airplanes ever had a gun installed. The same goes for the rear gun position.

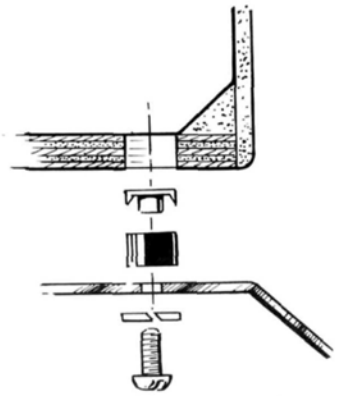
In some models an option existed to make the rear seat swivel 180° to face backward. If completely equipped, the rear canopy would work substantially different than the normal bird cage. When the rear canopy was slid

(Continued on page 95)

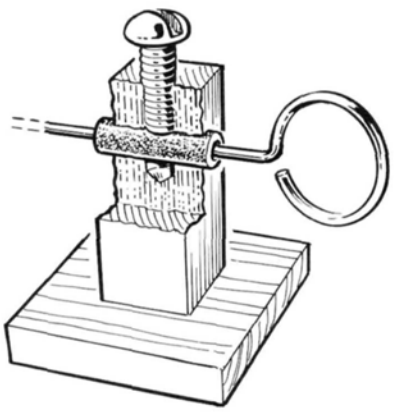
Hints & Kinks

by JIM NEWMAN

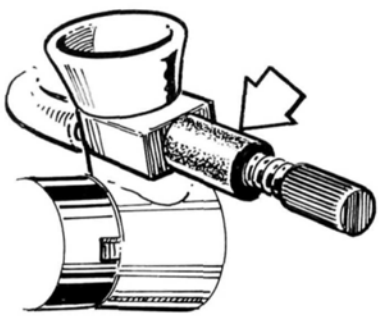
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News,** 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



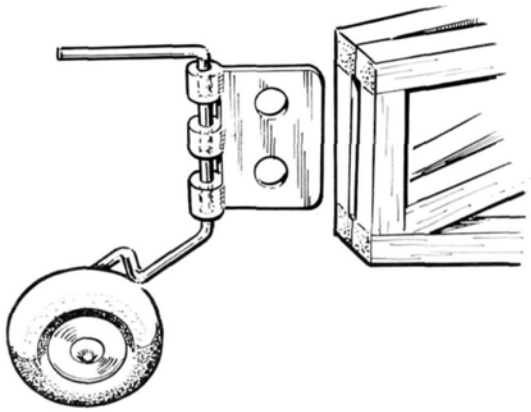
This modeler must have a very rough field! He developed this landing gear attachment that holds firmly enough but will pull out if he hits something—eliminating that expensive bottom repair. It consists of ⅜-inch diameter rubber hose, a 4-40 blind nut, and a lockwasher. The hose expands under the pressure and becomes a tight fit in the ¼-inch bottom ply. *Robert Emeny, Kelowna, B.C., Canada*



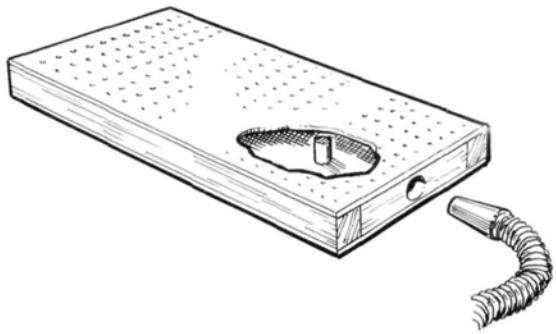
A very simple throttle friction device for your test stand. Screw clamps down on rubber tubing through which passes the pushrod. Pushrod has standard clevis on the other end.
Ed Koporc, Cortland, Ohio



An oldie but goodie: On TDs the friction ratchet tends to alter its setting as it wears. In addition, air leaks past the thread cause inconsistent runs. A piece of tight-fitting rubber tube over the threaded portion cures both problems. *Raphael Gonzalez, Watertown, Massachusetts*



For lightweight R/C, this readily available steerable tailwheel bracket is half of a nylon hinge. Very effective.
Sid Miller, Elk Grove Village, Illinois

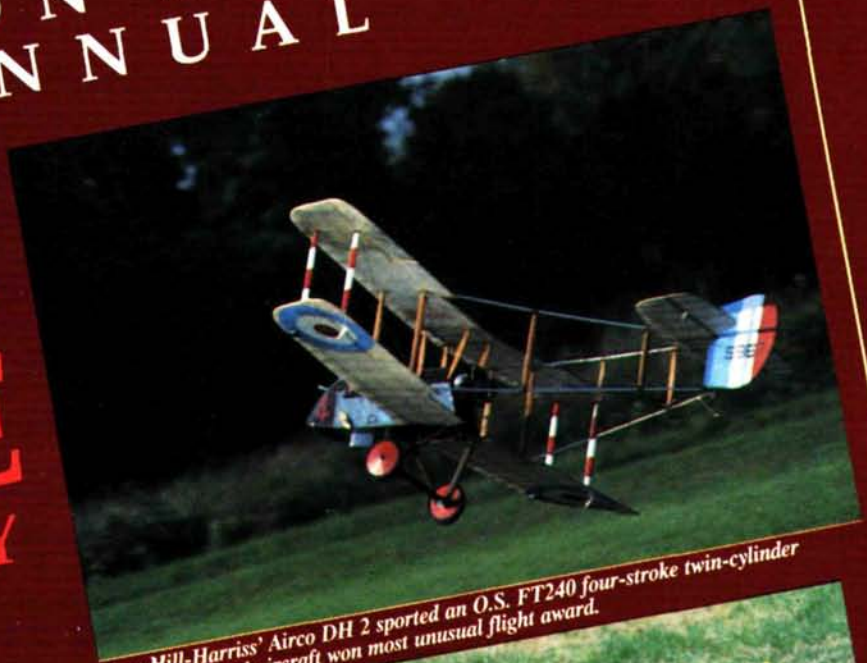


Ideal for apartment or trailer dwellers! This is a simple to make vacuum sanding table from 1x1-inch Masonite and peg board. Seal all edges with duct tape or a bead of caulk. Short dowel pillars, as shown, might be required to support the center. Plug in your vacuum cleaner to make it work.
Chuck Lovallo, Winnipeg, Manitoba, Canada

Ultra-light wheels especially for those ultra-light indoor "electrics." Cut bottoms from two foam cups, epoxy together, then stick that light, foam draught excluder around the edge. Epoxy brass bushing through center. Two inches weighs .075 ounce (half the weight of same size balsa wheel!). *Gayne Jones, Bainbridge Island, Washington*

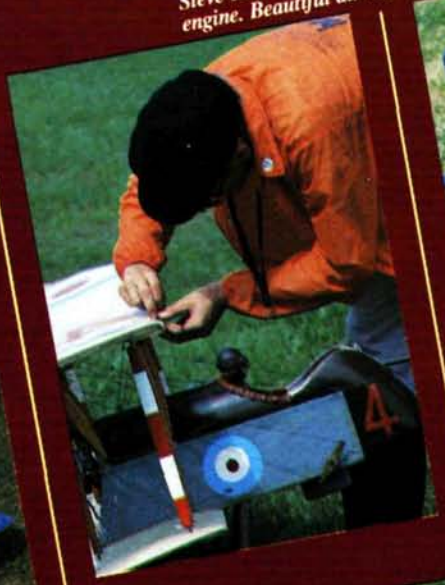
HAMILTON HAWKS 4th ANNUAL

FOUR-CYCLE RALLY



Steve Hill-Harriss' Airco DH 2 sported an O.S. FT240 four-stroke twin-cylinder engine. Beautiful aircraft won most unusual flight award.

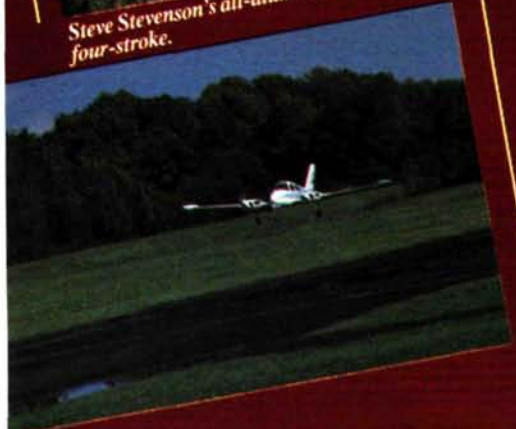
Kazuhiro Mihara's Bucker Jungmeister sported a fantastic O.S. 300 five-cylinder engine.



And some say four-strokes are a fad—hah!

Steve Stevenson's all-aluminum silver bird with Enya 90 four-stroke.

Upper left: Steve works on his DH 2. Above: Bob Hoseska Jr.'s F8F Bearcat with O.S. FS-90. Left: Bob Pound brought this Saito 80 twin-powered Pou de Ciel.



Left: Joe Utasi's twin O.S. FS-120-powered Cessna 310P was a magnificent flyer. Right: Steve Jones' BD-8 carried an O.S. FS-90.

by STEVE HILL-HARRISS

THE WEEKEND of September 27 brought perhaps the two most important days in the 1986 calendar of events for the Hamilton (Ohio) Area Wireless Kontrol Society, for this was to be the culmination of nine months hard work aimed at providing the best event in the area for fliers and afficianados of this marvelous four-cycle engine. As in previous years, this event was held at the HAWKS expansive club field in Joyce Park, about 40 miles north of Cincinnati. The 40 acres of flat land, bordered at one end by the Great Miami river, is equipped with a 300-foot hard dirt runway, and for the myriad dining canopies, a floor of grass.

There are two main ingredients to the successful rally: a sizable turnout and good weather. One hundred four attendees, 82 pre-registered, came from all over, one even from Japan.

The attendance figures must give the HAWKS the honor of having one of the biggest events of its kind in the midwest, an event that has gained in popularity from year to year. Not surprisingly, the contestants started to arrive early. First on the scene Friday afternoon, amid a flurry of last-minute preparations by the HAWKS club members, were Hazel Sig and Maxey Hester, who had promised at Toledo that they would attend. Maxey brought his red-and-white Morrisey Bravo, one of a pair present, the other belonging to Mike Gretz, also of the Sig stable.

The rally was a low-key, fun-fly arranged around six events—stand-off scale, timed flight, mini-pattern, old-timer, pilot's choice and mystery judging. Of these, only the scale event followed AMA rules, except with a twist: the models weren't judged in flying though they had to fly at least once in order to qualify the static score. Only 17 models were entered in this event, a lower turnout than in previous years, probably caused by last year's contretempts, who may have put a few folks off.

Timed flight always used to be a problem that resulted in a number of airplanes making their arrival on the runway, reminiscent of a parking lot at the local moonlight scale. Not any more. When the pilot thought his time was up, he had only to guide his plane over an imaginary line between him and a flagpole out on the far side of the runway. Entrants in the old-timer event had a one in nine chance of winning an ES40 since the winner of this and mini-pattern were drawn at random from those who qualified. The latter event, with 57 entrants, wasn't difficult to qualify in, the contestants having to perform a figure eight, loop, and a roll. Nor did these maneuvers have to be anything near perfect as long as one could satisfy the accompanying safety person that one had actually performed them. Mystery judging was a blast for the judges, and a headache, to. Categories such as most realistic flight (Bob Hoseka, Jr. with the Bearcat), most unusual flight (Lee McDuffee with my DH2), best "save" (Jim Buzek to the rescue of Tim Bailey's 4-40) and worst crash (Ben Mayne and the late Aero-Pacer) kept the judges embroiled for hours before they picked the winners.

Around lunchtime on Saturday, it rained. We refuged within a large tent until calm skies returned. Standoff scale judging was temporarily halted due to the thunderstorm but was completed by mid-afternoon.

Bob Pound from Rosendale, Indiana, brought another unusual and immaculately crafted airplane to stun the onlookers. The Pou de Ciel (Flying Flea) wasn't exactly known for its viceless performance back in the '30s. Unfortunately, we didn't see the model perform since it didn't place in the top three and Bob didn't want to take a chance on what would have been only its third flight. The model featured a tilting wing and laminated skids fixed to the fuselage with spring-loaded taper-turned aluminum struts.

Ron, the other half of the Flying Pound Brothers, entered his Fokker Eindekker equipped with wing-warping for lateral control. I took first place in standoff scale with an Airco DH2, an unusual WW I pusher biplane fighter which I built from my own plans two years ago, and Steve Jones placed second with his Bede BDB of simple lines and a striking color scheme; it was hard to fault.

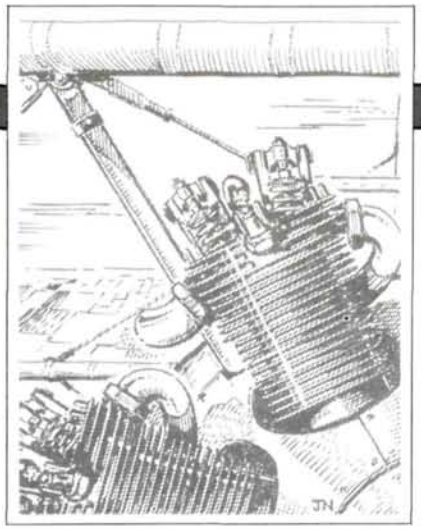
In third place was Maxey Hester with the aforementioned Sig Morrisey Bravo. Bill Cook's Gere Sport was another fine-looking entry having taken first place in giant scale at the Southern Ohio Model Engineers static show earlier in the year. Both this airplane and the DH2 were flown by Lee McDuffee, the contest director and popular figure at area pattern meets. With the skill and enthusiasm he displayed, it would come as no surprise if he were to forsake his pattern ships for scale aircraft in the near future. Four of the 17 aircraft were WW I vintage (DH2, Eindekker, Bill Brucken's Fokker DR1 and Bob Reed's Nieuport 11), where the four-cycle engine can be used to advantage not only in swinging that big prop but also in the more realistic sound.

On Saturday evening about 80 people attended a HAWKS roast beef dinner in the nearby F.O.P. hall. Afterward, a guest speaker from the Air Force Museum in Dayton gave an informative slide presentation of the museum's history that was a relaxing way to end a hectic first day.

Sunday's weather was particularly pleasant. Many of modeling's well-known names were present at the rally, as were a number of local hobbyists. John Maloney of World Engines (Cincinnati) was entirely responsible for the first three rallies when he owned the U.S. franchise for O.S. Engines. Along with Hazel and Maxey Hester, Dick Watz, Ben Mayne and others from Aerodrome Models, and Joe Utasi of Jomar Products, John was on hand to participate in the fun. Joe's Cessna 310P flew beautifully and with its tip tanks and new paint job looked very convincing. Maxey's Morrisey Bravo was much admired throughout the show and John's Robinhood 99 was a subject of interest prior to its assault in the trees.

Mr. Kazuhiro Mihara, president of O.S. Engines, brought

(Continued on page 105)



The Operation of Four-Stroke Engines

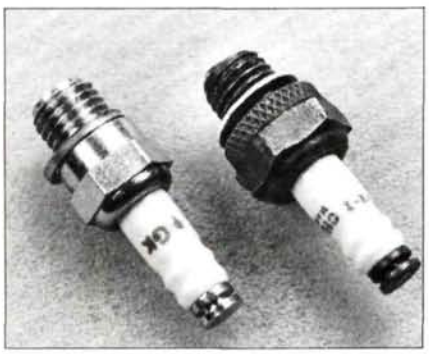
PART I

by PETER CHINN

The best advice that can be offered on operating a four-stroke engine is to first read the instruction sheet that comes with it. This might sound obvious but it has to be said that many modelers do not pay sufficient attention to manufacturers' instructions. Often this is because they have had experience with other engines and tend to rely on that knowledge and disregard what they may think of as information for beginners only.

When a user has had experience of a few four-stroke engines, he will have assimilated the basic principles of operating them, but there is always the possibility that a new engine coming into his hands will have certain characteristics that require special attention. This attention may be such that, to ignore it, may result, at the very outset, in damage to the engine itself, or even personal injury. Some manufacturers try to guard against such eventualities by including special warning notices with their engines. Never ignore them.

By and large, makers' instructions are adequate and accurate although, as most four-strokes are of foreign manufacture, English translations sometimes contain anomalies. More important, however, there are many points which require amplification for the wider understanding of the user.



In the heyday of the spark-ignition model two-stroke, miniature spark-plugs were provided by many leading manufacturers, including Champion (example right).

The purpose of this chapter, therefore, is to promote such understanding, to make additional recommendations and to point the user in a direction that will give him greater satisfaction and fewer problems in the operation of his four-cycle engine.

For easy reference, this chapter is divided into a number of sections with appropriate headings.

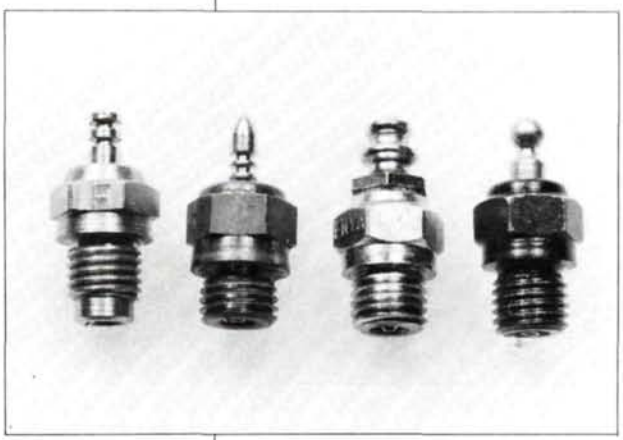
Fuel Mixtures

Like most model two-strokes, nearly all current model four-cycle engines operate on a methyl-alcohol (methanol) based fuel mixture. The reasons for using methanol, rather than gasoline, are several.

Methanol is more expensive than gasoline, added to which the amount required to provide the most efficient combustible mixture strength (about one part methanol to 9 parts of air, by weight) is much higher than for gasoline (about one part to 15 parts of air) which, of course, means that the engine's fuel consumption is increased. But the extra cost of running on methanol is offset by a number of points in its favor.

First, engines run cooler on methanol. They can be operated at higher compression ratios and deliver more power. Second, there is a greatly diminished fire risk when handling methanol, compared with gasoline. Third, the majority of

Typical glowplug clip and battery leads with switch and glowplug.



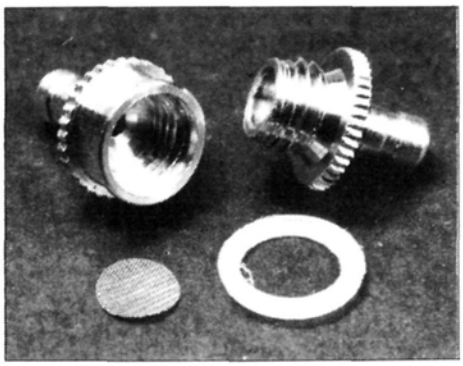
Four-stroke glowplugs (l to r): O.S. Type F, Saito P-1, Enya No. 3, Webra No. 3.

model four-strokes, like model two-strokes (i.e. true "model" two-strokes as distinct from converted chainsaw type gasoline engines) use glowplug ignition. Glowplugs work best in the presence of alcohol, their platinum alloy elements having a catalytic effect which aids ignition and enables the engine to continue to operate through wide variations in mixture strength.

Lubrication

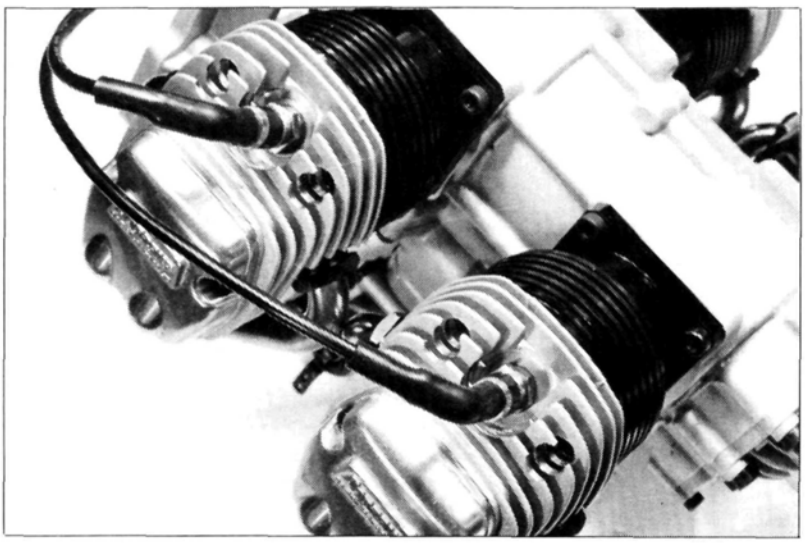
In full-size four-stroke engines, it is usual for the lubricating oil to be carried to the working parts by a pumped lubrication system, either from a separate oil tank or a crankcase sump. Crankcase-charged two-strokes, on the other hand, are lubricated by having a quantity of oil mixed with their fuel and this is also the method of lubrication used with most current model four-stroke engines. In the case of gasoline fueled spark-ignition two-stroke motors, the lubricant is usually of a conventional petroleum (motor-oil) type, but such oils will not mix with methanol and the traditional substitute for model engines, is castor-oil.

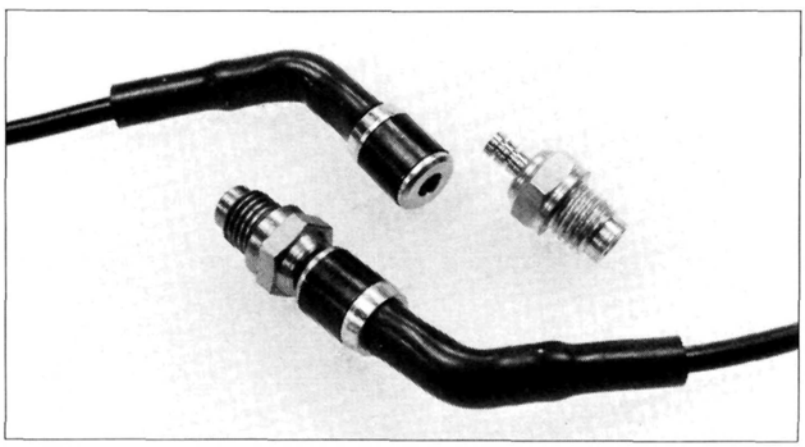
Castor-oil has great properties as an engine lubricant. Its advantages were discovered by the manufacturers of full-sized engines before the First World War and, despite the great strides that have been made in the development of special synthetic alternatives, castor-oil continues to be widely favored for mixing with alcohol based model engine fuels and justifiably so. To date, no substitute has been found that offers better protection against damage in the event of a "lean run" condition in which the quantity of lubricant is diminished, the engine overheats and the protective qualities of the oil are tested to the maximum. Castor-oil also gives better protection against corrosion than most synthetics.



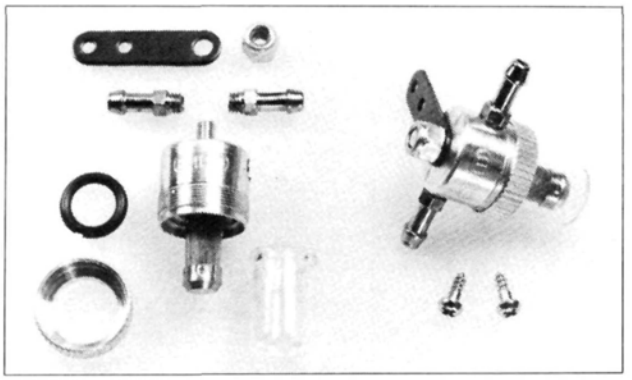
Fuel filters are essential. This good example from Fox Mfg. can be disassembled for cleaning.

The oil content of a typical *two-stroke* model engine fuel mixture is usually between 20 and 25 percent. Some of this oil is consumed with the fuel, but by far the larger part of it is ejected, unburnt, with the exhaust gases. In this way the oil performs the secondary function of helping to cool the engine by picking up heat from the hottest parts. Because a four-cycle engine has a firing stroke only once for every four strokes of the piston and runs cooler than a two-stroke, it is generally agreed that a four-stroke fuel mixture can contain a somewhat lower proportion of oil. Most model engine makers recommend a maximum oil content of 15-20 percent for four-stroke engines and some approve lower percentages (10-15 percent) although there has been a trend upwards again from the 5-8 percent figures that were suggested earlier by some manufacturers. The lowest proportion approved at the moment is the 2 percent recommended for the Kavan FK-50, but here the oil acts as an upper-cylinder lubricant only: the rest of the FK-50's moving parts are lubricated with oil that is pumped over the working parts, from a crankcase sump, by a camshaft





For twin and multi-cylinder engines, or enclosed installations, compact, firm-fitting connectors are essential. These O.S. connectors are fitted to the O.S. FF-240 Pegasus.



Alternative type of fuel filter from Saito with detachable sediment bowl.

driven pump.

Synthetic oils are approved as alternatives to castor-oil by some manufacturers. Others recommend that, where a synthetic oil is used, a proportion of castor-oil should still be included as a safety measure. The Saito company, for example, specifies that castor-oil should comprise at least 30 percent of the total lubricant content.

Nitromethane

The addition of nitromethane to model two-stroke fuels has long been known for its beneficial effect on power output: hence its use (where rules permit) in large quantities—50 percent and upwards—for high-performance racing engines. It is also used as a means (in smaller quantities) of improving flexibility and throttle response in all other engines.

Engine makers are, nevertheless, divided in their views as to the desirability of having nitromethane in four-stroke fuels. When manufacturers began introducing model four-strokes to the market in the late nineteen-seventies, most of them recommended the use of between 5 and 15 percent nitromethane. As a result, a 10 percent nitromethane content has become widely recognized as the norm for four-strokes and as the standard fuel for comparative testing of four-stroke engines, except when a factory may specifically recommend otherwise.

By contrast, some manufacturers do not advise the use of nitromethane at all, on the grounds that it increases the risk of corrosion occurring within the engine. For example, the makers of the high-performance Laser four-stroke engines disapprove of the use of both nitromethane and synthetic oils and recommend a straight 80/20 blend of methanol and castor-oil instead.

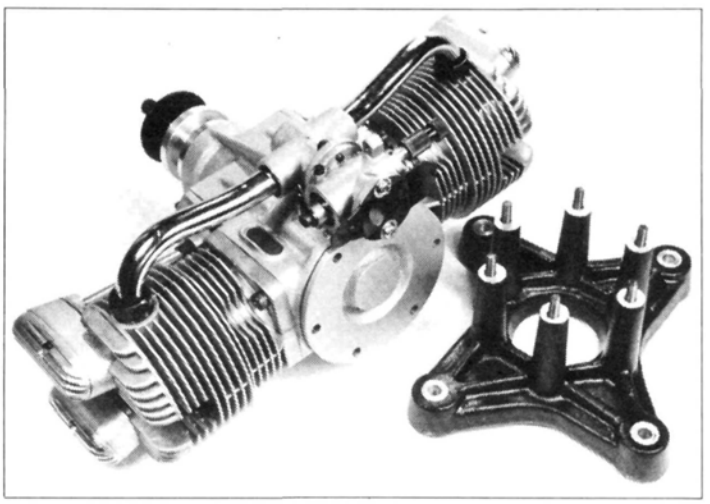
Four-cycle motors are more prone to suffer bottom end cold corrosion than two-strokes for a variety of reasons and can occur without nitromethane having been added to the fuel. Measures for guarding against such corrosion must be taken. These include keeping idle before shutdown to a minimum and avoiding rich mixture shutdowns. The best system is to open the throttle run at full power for 30 seconds and shut off the fuel supply. Finally, inject some corrosion-inhibiting oil through the crankcase breather and rotate the prop several times.

Commercial Fuels

The above comments on fuel mixtures are made partly on the assumption that the modeler is able and willing to obtain the materials to blend his own fuel. In some cases this will not be so and the user may well find it more convenient to purchase a ready-mixed commercial model engine fuel from his local hobby dealer. In this case, the four-stroke owner is advised to take note of the previous remarks and to select a fuel mixture that approximates to the maker's recommendations. Several fuel manufacturers are now offering fuels that are blended specifically for four-stroke engine use. For example, K&B "125" four-cycle fuel is blended with castor-oil and contains 12½ percent nitromethane. Sig "Premium" four-stroke fuel is also blended with castor-oil and is available in a choice of 10 percent or 15 percent nitromethane. Both manufacturers also offer straight methanol/castor-oil fuels that can be substituted where the engine manufacturer specifies such mixtures.

Glowplugs

When four-stroke model engines were first introduced, it was commonly believed that special glowplugs would be necessary in order for them to retain sufficient heat through the four-cycle engine's two extra non-firing strokes. The original O.S. FS-60 engine was, in fact, fitted with a special plug, the O.S. Type F, which is still standard equipment on O.S. four-stroke engines. However, most model four-strokes operate quite satisfactorily on ordinary (usually "hot" rated)

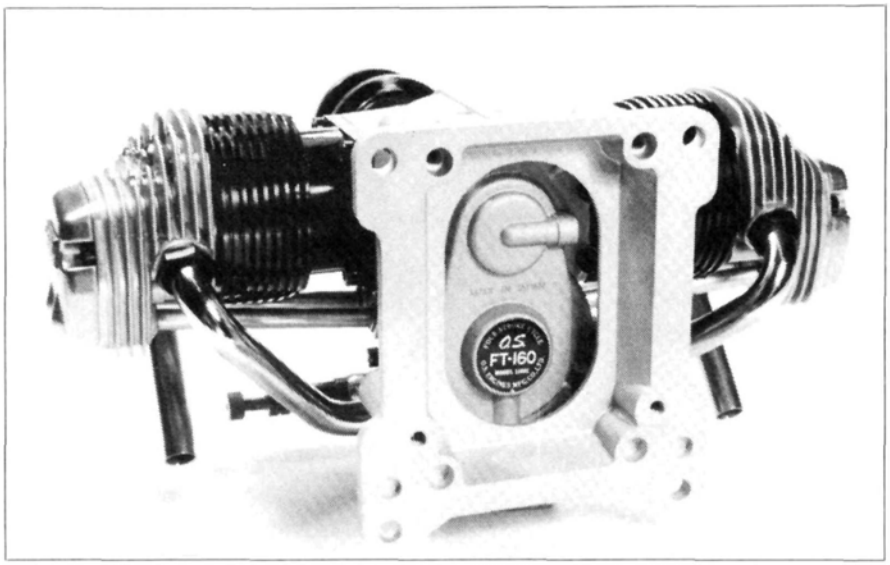


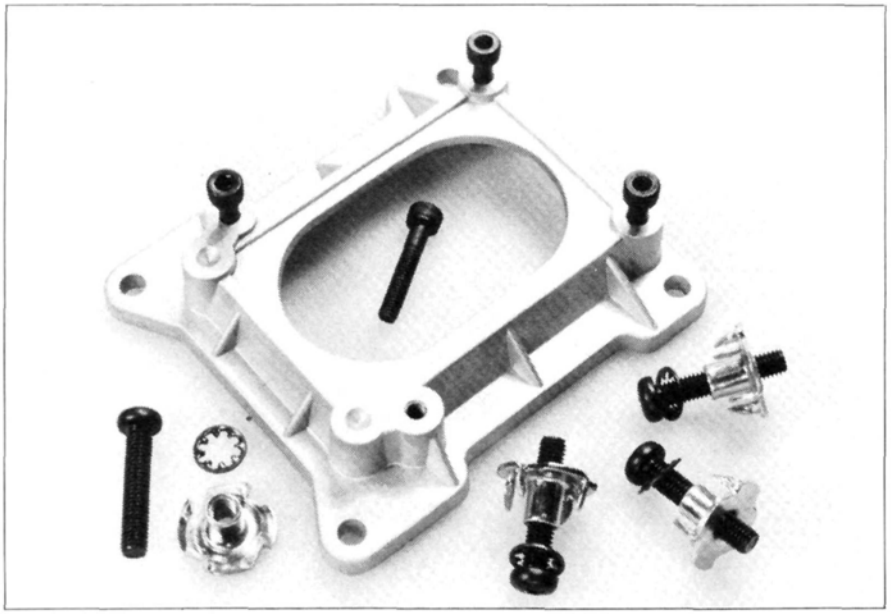
Good heavy-weight cast-aluminum radial mount for the big 2.75 cu in. Saito FA-270T Twin.

model two-stroke plugs.

The main difference between conventional glowplugs and the O.S. Type F is that the latter has a longer body and the portion containing the heating element extends, in a reduced diameter, below the threads. In this way, the threads in the cylinder head do not have to break through into the combustion chamber. This can be helpful in the design of a small engine where space is limited by the need to find room for two valves and a glowplug within an acceptable combustion chamber shape. In fact, in all FS-60 engines, with the exception of the very earliest (1976) production model, the plug was contained in a socket above the combustion chamber and ignition took place between the socket and combustion chamber through a hole having a diameter of only 3.5 mm—a little more than half that of a normal plug hole.

In regard to the choice of glowplugs, the user is advised, once again, to follow the engine manufacturer's instructions. To date, glowplugs have shown a tendency to last longer in four-stroke engines than in two-strokes but if, in an emergency, it becomes necessary to replace a burned-out plug and another of the same type is not readily available, some caution may need to be exercised.





Excellent pressure-cast bulkhead mounting plate is supplied with O.S. Gemini 120 and 160 and Pegasus FF-240. It can be permanently fitted to the aircraft firewall with screws and blind-nuts supplied, enabling the engine to be quickly removed by unscrewing four hex-headed cap screws.

For instance, any attempt to fit a conventional long-reach plug to an FS-60 will result in the plug "bottoming" in the plug hole, instead of seating properly in the head. The use of an idle-bar type plug would make matters ever worse; in fact, bar type plugs, in general, are not suitable for four-stroke motors. On the other hand, while O.S. Type F plugs have been successfully used in many four-strokes, their extra reach makes them totally inappropriate for some other four-stroke engines.

An example of the importance of making sure that plug reach is correctly matched to the engine, is to be found in the Austrian Hirtenberger HP VT-21 rotary-valve four-stroke. This engine uses a conventional long-reach (7/32 in.) plug, but with a special *extra-thick* (1.5 mm) washer. Standard plug washers are only half this thickness and will actually allow the plug to bottom against the chromed brass sleeve in which the vertical cylindrical rotary-valve revolves. It is very probable that, if the plug is tightened under these conditions, it will distort the valve sleeve. Unfortunately, in this particular engine, such distortion would call for the replacement of the entire cylinder and crankcase assembly, an expensive mistake which emphasizes the need for caution when dealing with some engines, even when changing such a simple item as a glowplug.

Breaking-in

"Breaking-in" or "running-in" can be defined as the process of aiding an engine's transition from a newly assembled assortment of metal parts to an efficient working machine.

It means running the engine under carefully controlled conditions at the beginning of its life in order to avoid the risk of immediate damage to certain components (or their premature deterioration subsequently) and to help working parts to become smoothed and aligned for maximum mechanical efficiency.

Every internal combustion engine, large or small, to a greater or lesser degree, needs some extra care when new. No matter how well an engine is made, its working surfaces are microscopically "rough" when new and parts are apt to distort from the effects of combustion pressure and excessive heat. Rough surfaces and distortion mean increased fric-

(Continued on page 98)

Helicopter Cha

by CRAIG HATH

LET'S TAKE a moment to reflect on the subject of vibration, an area that is very misunderstood.

Consider the rotor head and blades on the typical model helicopter as something similar to a ceiling fan. When the fan is spinning very slowly, you'll hardly notice any wobbling or shaking. As the fan speeds up, it will wobble and shake if it's out of balance. It isn't hard to find a ceiling fan that is out of balance. If you were to increase the fan speed enough, it would be possible that the frequency of the vibration would increase to the point that it is no longer visible by the human eye, provided that the fan didn't shake itself to pieces before it reached this speed. This same condition applies to the model helicopter. Most of the model helicopters today operate in the range of 1,200 to 1,800 rpm main rotor speed. On the lower side of that spectrum, even slight vibration is visible on some part of the helicopter. Yet, at the upper end of the scale, the vibration would need to be fairly pronounced to become visible. By visible, I mean a shake in the tail boom or landing gear.

The effects of vibration can create many different problems for the R/C helicopter. Number one problem is radio system failure. Our radio systems will take quite a bit of abuse, however, the strains placed on them by severe vibration can cause the system to fail. The next big problem is mechanical failure. When you begin to lose nuts and bolts, it's time to investigate the cause.

The author prepares to check pitch curve on one of his machines. See text.

Don't overlook your engine; it can be a source of problems. I recently replaced the bearings in an engine that had ingested a few of the balls from the rear bearing. This engine is suspected of causing radio interference and vibration due to this problem. Not only should the mechanical condition of the engine be checked, but the general operation should be monitored, too. I have witnessed several vibration problems that were caused by an engine that was running rough. For the most part, if your engine is just breaking into a two-cycle sound, it will be operating in the proper range. This should be the case at all times above idle. If the engine is allowed to run too rich it can shake the whole helicopter. On the other hand, allowing the engine to run too lean can cause damage to the engine from overheating. So take your time and get the engine running right. If you aren't sure about the proper operation of the engine, get help.

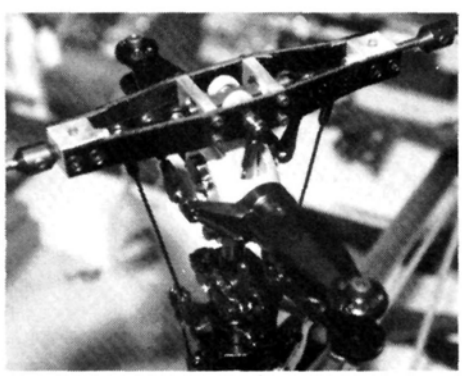
Other areas that shouldn't be overlooked when searching for vibration include the cooling fan and clutch, the starting shaft, the main drive gear, and all of the tail rotor assembly. This sounds like a lot, yet if you have followed my suggestions during the assembly process, most of the items mentioned have already been checked for balance.

Any effort spent in the search for vibration will pay off with increased reliability and less maintenance along with a much smoother helicopter.

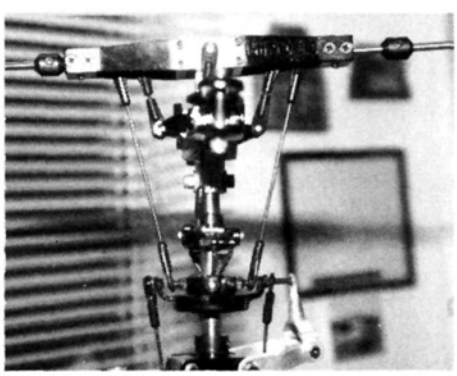
Adding the Rotor Head

Some kits will require that the rotor head be assembled. This process is no

Typical rotor head setup shows the various linkage adjustments.



Where there are pairs of linkages, links need to compare with each other exactly.



Taking care of the rotor head setup will save much time when trimming a helicopter.

different than any other phase of assembly, provided that you carefully follow the instructions. When you're assembling the rotor head, be sure that there is no binding in any of the bearings or moving parts, and always use a thread-locking compound on all screws that are not joined with a nylon insert lock nut.

The addition of the rotor head assembly will be the next step in the construction of our imaginary model. The rotor head can be approached from a couple of different angles depending on the type of equipment you have available. If you own a High Point Balancer and a blank main shaft with counterbalance as mentioned in the March 1987 issue of this column, then you'll want to check the rotor head for balance before you add the flybar and stabilizer paddles, along with the rotor blades. If you don't have the High Point Balancer, I know of no sure and accurate way to check the rotor head, so you'll have to bypass the process altogether.

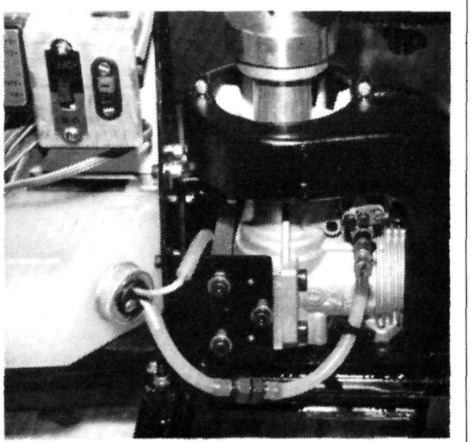
Once the rotor head has been checked for balance, it's time to add the flybar and stabilizer paddles. There are two types of flybars. One type passes completely through the rotor head, and the other type is of a two-piece design that bolts on to the see-saw at each end. It is very important that the flybar paddles be equally spaced away from the see saw. If you have the High Point Balancer, it is a good idea to check the rotor head for balance after the flybar and paddles have been added. If your system uses a collar with setscrews to retain the flybar and control lever, be sure to use a thread-locking compound to secure the setscrews.

Now you'll need to assemble the main rotor blades and check them for balance. For now, you'll need only to follow the manufacturers suggestions for blade balance. Once the blades are assembled and covered, you may bolt them onto the rotor head. Most of the kits are intended to allow the blades to swivel in the holders so that they may find their own lead or lag. Be sure that each blade will be free enough to swing with the blades bolted down.

Scott Mearns has been at the controls of almost every type of helicopter for many years. He does not use high-tech gadgets.

Good help saves time, money, and accelerates progress for any novice.

Making the linkages for the rotor head will complete the assembly of the mechanics. When you're adding the universal ball links to the threaded rods, be sure that any time you are making two of anything that they are exactly the same length. If the rods which run from the swashplate to the rotor head are of unequal length, the pitch curves will be different for each rotor blade, making it impossible to keep the rotor blades in track throughout the collective range.



Notice plate to house switch and charging jack to make body removal easier. Note use of fuel filter.

Also be sure to check the links for smooth movement.

Adjusting the Pitch Curve

Setting the collective pitch curve can be handled in only one manner as far as I'm concerned. With the specialized radio equipment that we have available, it is important to understand what you're trying to accomplish before you attempt it. Getting the main rotor pitch set to the correct parameters means that the speed of the rotor head is correct in all flight conditions from hover to full throttle to descent and landing.

Start by checking the main rotor pitch at the hover or half throttle position. After the hover pitch has been set, set the high and low pitch. A good ball-park pitch range for the first time flier is ½° positive at idle, 4° to 5° positive at hover, and 7° positive at full throttle. Mechanically set the pitch for hover by adjusting the length of the links that are the last connections to the rotor blades. These are the only links that will be adjusted when setting the pitch curve and for tracking the rotor blades. Be sure that the trim lever or knob for the pitch channel is in the neutral position before you make any adjust-

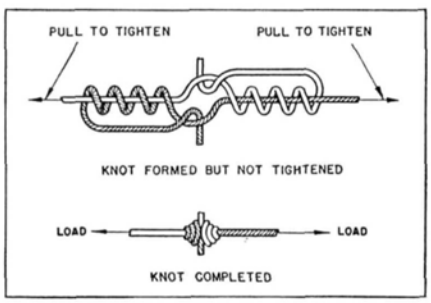
(Continued on page 90)

Research Room

by GENE THOMAS

A MASSIVE RESEARCH project. Back to the files and books...only to discover that over the years much has been lost. It is unfortunate that some people do not appreciate the value—or maybe they do—of the material they borrow. And who are *they* anyway?

Case in point: I had a book written by Santos Dumont entitled *My Air Ships*, a hard-bound cover that looked like a child's book—but the information it contained was invaluable! Gone. I discovered also that I lost my entire file on the Stinson Series drawings, something that had remained safely tucked away for years. Fortunately, though, as a photographer I have duplicates of most every photo that has at one time or another occupied my files. It is also fortunate that *Model Airplane News* has published (out of print for two years, since replaced by *Scale Aircraft Drawings* and others in progress) the *Best of Wylam*,



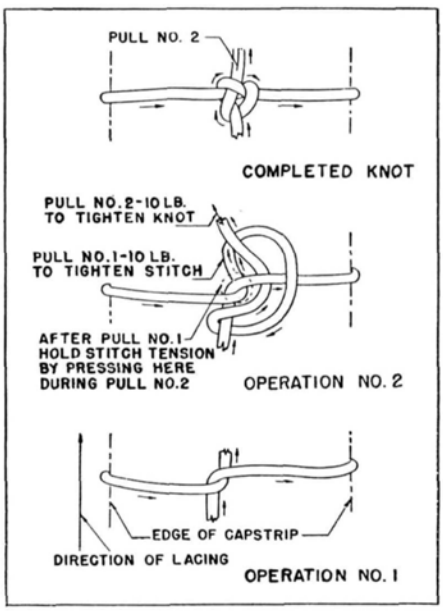
from which I'll be able to obtain the drawings I lost to "some friend." (And what *was* his name?...)

Over the years, I've discovered that little borrowed material ever finds its way back to base. Much of what is lost is impossible to replace. I wish that borrowers could comprehend that it is more than just a hobby, it's my *business*, too. The saddest part of this may be the lost model, the one that will never be produced from the missing material. When it comes to lending, I've become *Mean Gene*.

My experience in writing about the old planes has been incredible. My hands-on experience with many of the aircraft

The Bellanca Columbia as it appeared for the New York-Berlin flight. Notice the many details that can be modeled.

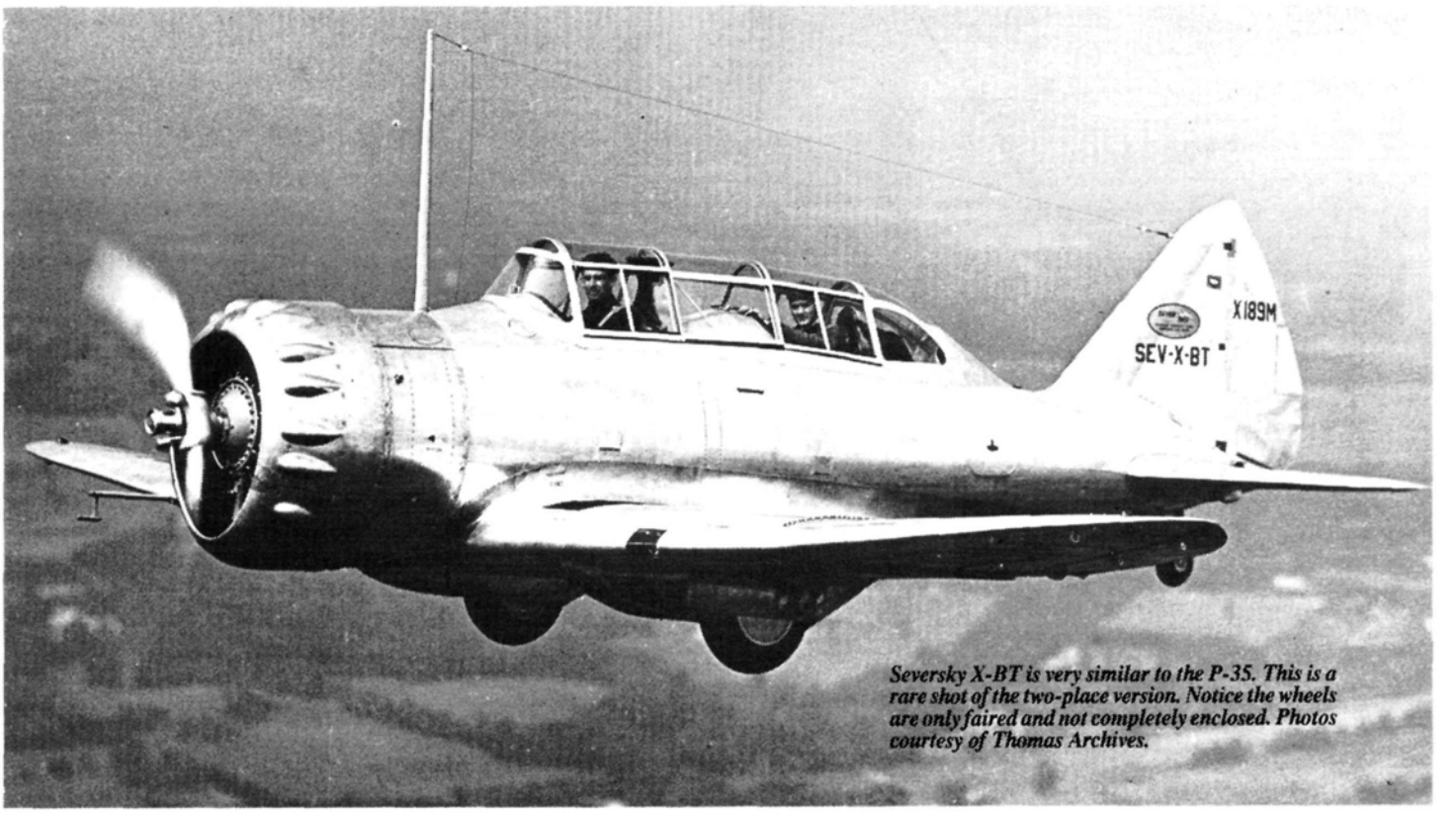
Drawings, left: Splice knot as used on aircraft. Below: Standard knot for rib lacing. Far right: Standard knot for double loop lacing.



present has made my current project one of the great joys of my life. If only to revisit my files...to peruse the many books I've ignored for years..to relive the many aspects of each airplane that once attracted me. All possible because I have a reference file with which to begin.

Those of you who have read my stories, columns, and articles may recall my frequent allusions to a series of books entitled *U.S. Civil Aircraft*, formerly published by Aero Publishers of Fallbrook, California. An unfortunate fire put Aero out of business and consumed almost all the stock. The series (Nine volumes in all) contains photographs and data on all U.S. civil aircraft from A.T.C. Number 1 to 900. A life's work, up in smoke! If you should have any of these books, cherish them because you probably won't find any more; and if you do, buy them.

You who build Scale have imposed on yourselves yet another criterion as it is not just another flying model that you build, but one that must be justified. Many of you think that my attitude is horrid; however, the few of us who built Scale years ago could get away with a blob for a

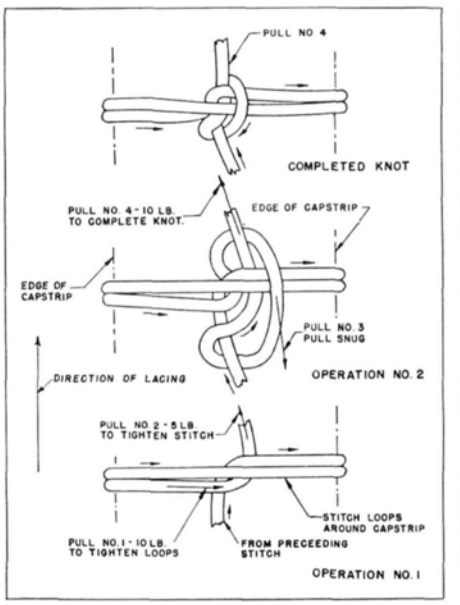


Seversky X-BT is very similar to the P-35. This is a rare shot of the two-place version. Notice the wheels are only faired and not completely enclosed. Photos courtesy of Thomas Archives.

navigation light on a small airplane. The advent of Giant Scale has created more of a problem in that the mistakes are amplified by the size of the model. And how few model builders, despite their so-called expertise, actually know what they're modeling! Few ever attempt to locate background information!

Many of you will say, "Scale is Scale." How knowledgeable are the scale judges to whom you subject your models? From my experience, the host club shouldn't allow any member to compete in Scale or any other event, but it should remain just the host. Or, a certain member of the club may win because his buddy happens to be judge.

This is supposed to be an informative column: if you write me (which I do enjoy), please don't tell me you have your Stinson Reliant (SR-9) almost finished, because I don't have documentation material on it. The best scale drawings on the airplane are published in the *Best of Wylam.* Unfortunately, I cannot answer every letter I get nor can I respond to all questions, but I will search my files and attempt to help anyone with a legitimate problem, even if it concerns just the size of a single bolt.



Recently, Art Schroeder came by with a friend, and we sat around and discussed model aviation, of course, coming to the conclusion that I have a small museum here. Art suggested that "you have enough material to keep it going for the next twenty years"—maybe longer, actually.

Some time ago I published engine drawings from my file (hope you saved them). I still have my copies of "Grid Leaks" from which I once used schematics to build and fly planes. Also, many of you will recall TTWP, which did indeed control three functions on a single channel. I've flown them.

But I don't write this column for my own gratification. So, in closing, I ask for more reader participation. Otherwise, as in the past, I'll arbitrarily choose a subject for discussion.

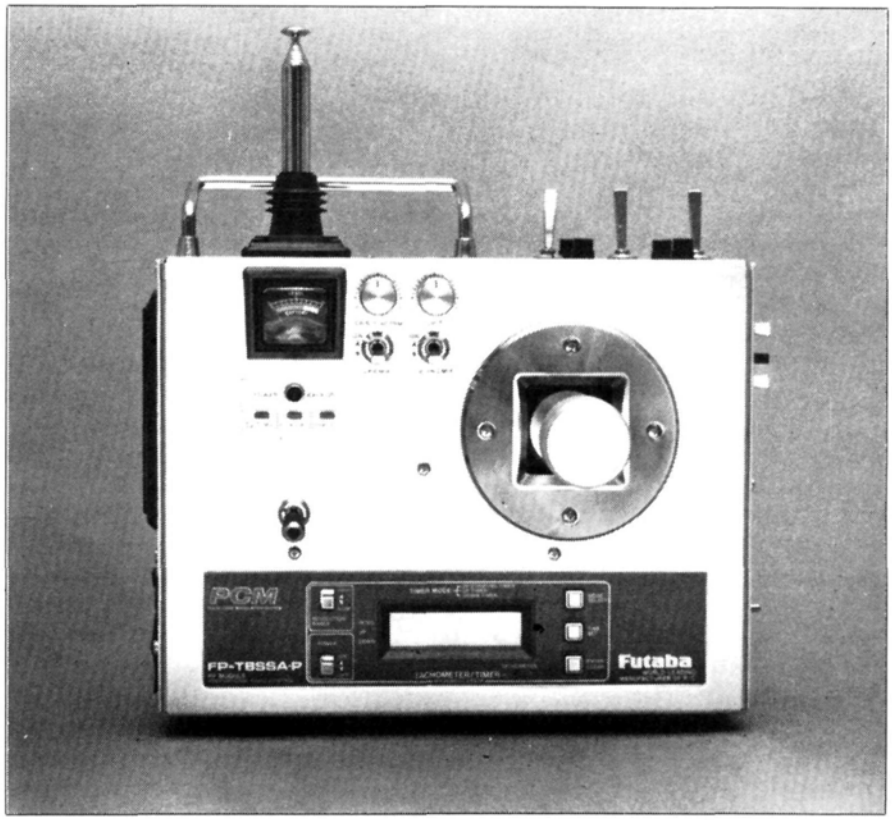
Don't forget to save it all for your files—and have many happy landings! ■

Control Tower

by CHARLIE KENNEY

THIS MONTH I have a dilemma on my hands. I have a review on the new Futaba* FP-8SSA-P PCM single-stick radio system (which is probably one of the most capable units I've ever seen) and I have to fit it into the limited space of this column. An almost impossible task, but I think I have a solution. The airborne system is identical to the Futaba FP-8SGAP two-stick PCM radio which has been out for several years and already described in detail, so I'd like to concentrate on the single-stick transmitter and let the photographs and drawings speak for themselves.

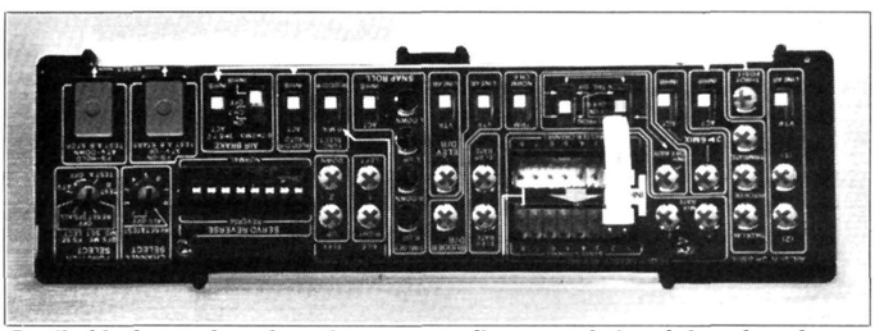
Before that, a brief general description of the radio set is in order followed by its features and technical specs. The particular radio I received operated on Channel 48 (72.750 MHz) with flag color code yellow-gray. In addition to the FP-T8SSAP transmitter, I received the FP-R118GP receiver, four FP-S130 servos, an SWH-5 switch harness, an NR-4J Ni-Cd airborne battery pack, a battery charger, a direct servo controller cable, a charger adaptor cable, servo trays, a frequency flag, spare horns (three per servo), a rear panel adjustment screwdriver, and servo-mounting hardware. Let's take a look at some of the FP-8SSAP system features:



Futaba FP-T8SSP single-stick PCM transmitter with its uncluttered front panel. Tachometer indicator at bottom center.

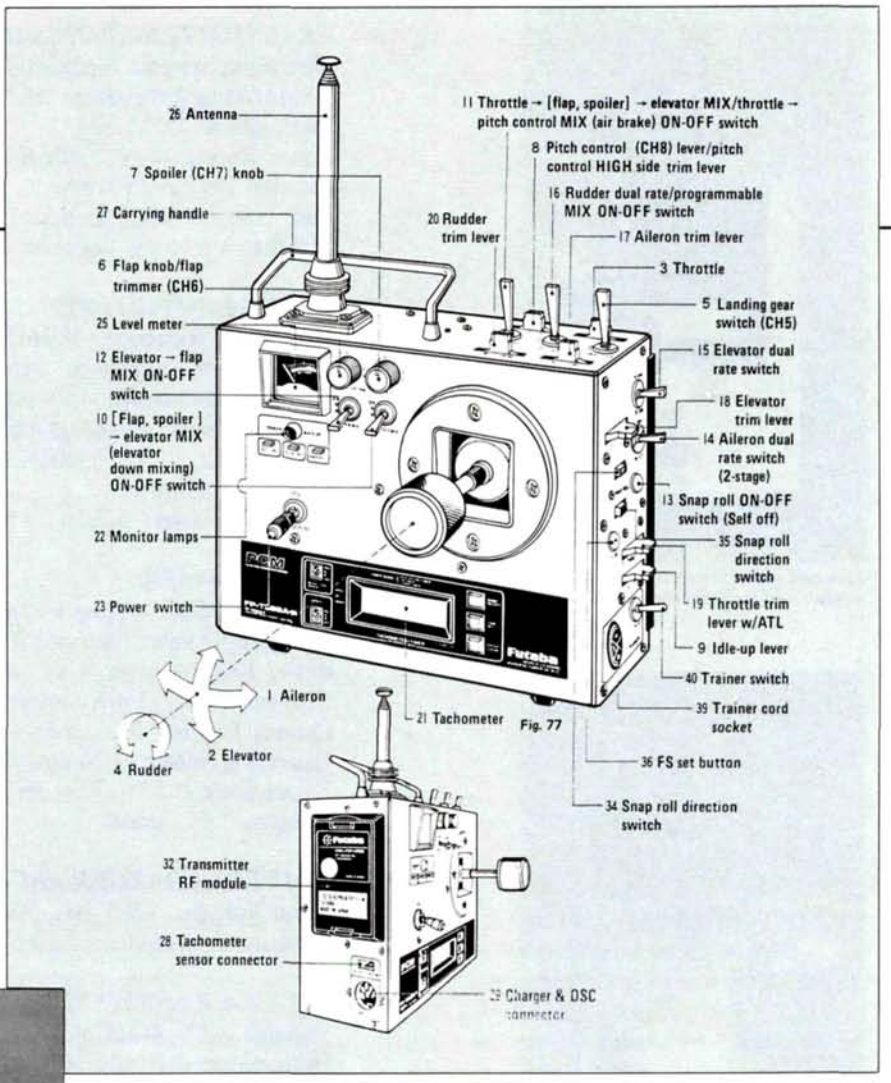
TRANSMITTER FP-T8SSAP

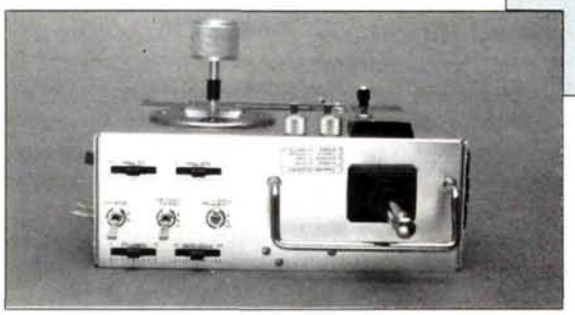
- RF system. The module can be easily changed.
- DSC (Direct Servo Controller) allows operation of the servos without turning the transmitter on. Cable operation is possible by using the special cord supplied.
- Servo-reversing on all channels.
- Dual-rate or non-linear VTR (variable trace ratio) aileron, elevator, and rudder. Two-stage dual rate on aileron.
- Rudder auto dual rate. Rudder dual rate can be turned on and off automatically with operation of the throttle lever.
- Newly designed open gimbal stick provides great operation feel. Stick position and spring tension are adjustable.
- New throttle and pitch control mixing is perfect for variable-pitch propeller which maximizes engine power and propeller efficiency if you use one.
- Mutual mixing function allows aileron plus elevator, aileron plus flaps, and aileron plus rudder mixing, and aileron differential operation.
- Elevator and flap mixing is especially advantageous in circle aerobatic maneuvers if you fly an F3A aircraft.
- Flap, spoiler, and elevator mixing allows control of the aircraft attitude while using the air brake (flap, spoiler).



Detail of back control panel permits numerous adjustments, slaving of channels, and servo-reversal on 8 channels.

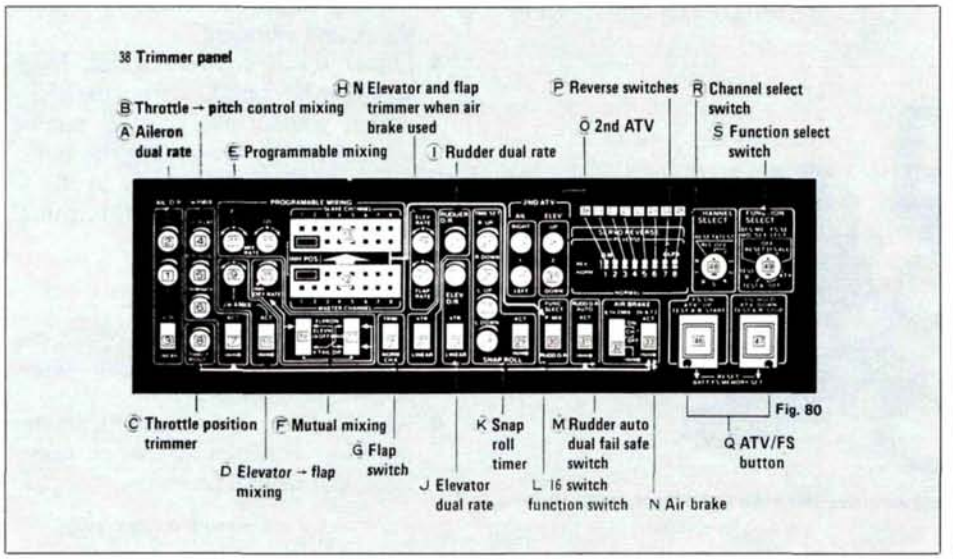
- Throttle and elevator (flap, spoiler) mixing allows enhancement of the air braking effect by throttle lever operation when diving and landing.
- Four-function snap-roll switch.
- Idle-up lever, the engine idling speed can be independently adjusted during throttle and pitch control mixing.
- New single-chip PCM microprocessor allows one-touch fail-safe setting for an afternoon of flying.
- New ATV (Adjustable Travel Volume) on all channels allows independent adjustment of servo left, right, up, and down throw.
- Fail-safe switch (function off switch) is provided so that only the desired functions need be turned on.
- Throttle ATL makes throttle linkage simple and positive.





photos by ACE PHOTOGRAPHERS

Above: Diagram showing various control and trim functions. Left: Top controls include trim, mixing, throttle, and landing gear control. Below: Diagram of control panel.

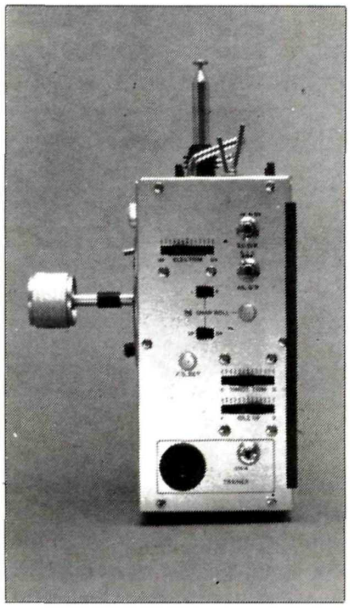


- Tachometer/timer with built-in display is provided.
- High-quality anodized aluminum case with sophisticated transmitter design gives easy, comfortable feeling to your hands.
- Trainer system capability offers an easy flight training provision for fledglings.

RECEIVER FP-R118GP

- The FP-R118GP is a miniature PCM receiver of the very highest reliability and incorporates the latest state-of-the-art advances.
- Miniature PCM receiver with high-speed single microprocessor. Resistance to adjacent band and man-made noise interference has been increased by an order of magnitude.
- Microprocessor servo hold function eliminates erroneous operation when a "dead point" area is entered.
- Microprocessor provides fail-safe and battery fail-safe functions for greater safety.

Left side of Tx shows removable RF module and tach and charger sockets.



Tx right side shows trainer cord receptacle at lower left and buddy box switch at right.

TRANSMITTER FP-T8SSAP
Operating System: Single-stick, 8 channels for F3A pattern
Transmitting Frequency: 53 MHz bands, 72/75 MHz bands
Modulation: PCM, FM
Power Requirement: 9.6V 8/500-mAh internal Ni-Cd battery
Current Drain: 250 mA
Size: 8.0x2.87x6.25 inches
Weight: 3 pounds, 4 ounces

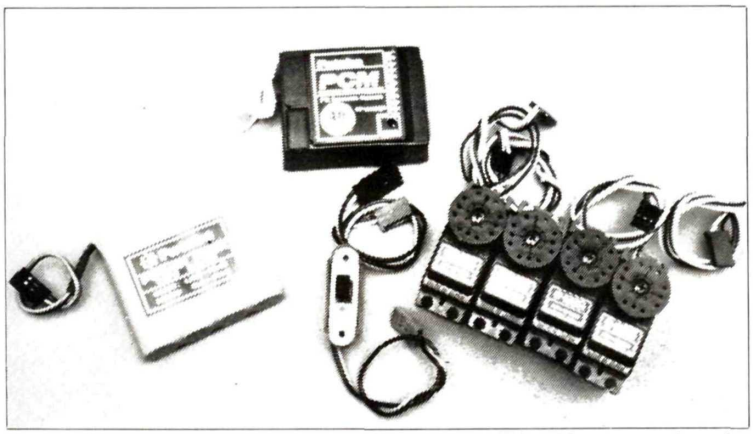
RECEIVER FP-R118GP
Receiving Frequency: 53 MHz bands, 72/75 MHz bands
Intermediate Frequency: 455 kHz
Power Requirement: 4.8V Ni-Cd battery (shared with servo)
Current Drain: 42 mA at 4.8V DC
Dimensions: 2.23x1.65x0.94 inches
Weight: 1.85 ounces
Receiving Range: 500 m on the ground, 1,000 m in the air

SERVO FP-S130
Control System: +pulse width control, 1,520 uS.N
Operating Angle: One side 45° or greater (including trim)
Power Requirement: 4.8V (shared with receiver)
Current Drain: 5 mA (at idle)
Output Torque: 55.6 oz-in.
Operating Speed: 0.24 sec/60°
Dimensions: 1.52x0.77x1.36 inches
Weight: 1.47 ounces

BATTERY CHARGER FBC-8B(2)
Input Voltage: 120V AC, 50/60 Hz
Output: Transmitter side, 9.6V/45 mA; Receiver side, 4.8V/45 mA

RECEIVER SERVO Ni-Cd BATTERY NR-4J
Voltage: 4.8V, 4/500 mAh
Dimensions: 2.01x2.28x0.59 inches
Weight: 3.35 ounces

- Error lamp display indicates checking of the receiver is in order.
- DC-DC converter in receiver power supply improves low-voltage operation characteristics.
- High-sensitivity design with RF amplifier.
- Ultra-narrow-band ceramic filter and PCM system are virtually invulnerable to adjacent-band interference.
- Gold-plated connector pins eliminate poor contact. Polarized connector housing improves reliability against shock and vibration.
- Direct servo control circuit. Each servo can be controlled from the transmitter, without ever turning on the transmitter, by connecting the transmitter DSC cable directly to the C position on the receiver terminal block.



The Futaba PCM airborne system including receiver, 500-mAh power pack, and four FP-S130 servos.

SERVO FP-S130

- Small, double ball bearing, water and dust-tight servo. High output torque 55.6 oz-in. .24sec/60°.
- New indirect drive potentiometer improves vibration and shock resistance, and neutral precision.

(Continued on page 107)

Learning to Hover

by DAVID TROST

LEARNing to hover a helicopter can be exhilerating, or frustrating. Your success or failure depends on many factors, the most important of which is patience. The old saying that "little feet take little steps" is apropos to model helicopter flight training—so don't rush it. An important rule to remember when flying model helicopters is that a model helicopter isn't much different from an inverted lawn mower and can do as much damage as a mower can to people or property. Never fly close to or over people. Don't fly near obstacles. Model helicopters crash for many reasons, but stupidity should not be among them: keep the hobby safe by being thoughtful.

The best way to learn to hover your new machine is to find an experienced helicopter pilot and have him set-up and trim the machine. A well-trimmed model is much easier to learn to fly. Once the machine is trimmed, you can go off by yourself and learn to hover. This is the way I learned. Learning to hover is an activity that can only be learned by hands-on experience. An instructor really doesn't have to be present all the time. Some of you might be thinking, "What about using a buddy box for training?" Well, buddy boxes work well for fixed-wing training but they're less suited for helicopter training. Not only must the master and slave transmitters have all the same trims and servo rotations, but the tail rotor compensators, pitch/power curves, high-idle and throttle-hold settings must be exactly the same. I know from experience that all these adjustments can take a long time to perform. When using the buddy box system with helicopters, the instructor must be more attentive than with fixed-wing training. He must pretend to fly the machine when the student has control so if the student gets into trouble he can quickly be in full control without having to figure out where the power is set or if the throttle hold is on. If the buddy box training method is desired, use it only for forward flight or aerobatic training. When hovering close to the ground, most of the time the instructor cannot react fast enough to prevent a crash. So I don't recommend buddy boxes for hover training.

Hover training begins with the proper procedure for starting the engine. Rule 1: always hold the rotor head firmly when starting the engine or anytime when it is running and the machine isn't on the flight line ready to take off. Rule 2: start the engine only at idle.

The night before the first run, check all the bolts for tightness and linkages for adjustment. Don't overlook anything. Charge the radio batteries fully. Hovering a helicopter puts a large drain on the battery pack so it must be in top condition. Pick a flying site that has minimal dust and dirt. A grass field is best. Prolonged hovering over dirty asphalt will substantially shorten the life of the machine because dirt enters the bearings and wears them out. Pick a day with a light breeze; it helps to keep the tail rotor under control. Attach the training gear with plenty of rubber bands. Range-check the radio according to the procedure in the radio manual. If the range is good, then fuel the chopper, if not, find out the cause; do not try to fly the machine. With the glow plug disconnected, advance the throttle stick to full and apply the electric starter for a few seconds to draw fuel into the carburetor. The needle valve should be set to manufacturer's instructions or about one-quarter turn richer than the setting used if the engine was broken-in with a propeller. Bring the stick back down to idle. Set the idle trim about half way and make sure once more that the controls all move in the proper direction. Set the tailrotor compensator, following the manual, and turn the throttle-hold and high-idle switches off. Firmly grip the rotorhead, connect the glowdriver, and start the engine. If the engine starts and the clutch grabs quickly, lower the idle trim or the clutch may be damaged. Always grip the rotorhead as if you

(Continued on page 76)

Gorham

HUGHES 300

by DICK TRISTAO

A neat scale rendering of a sport chopper.

THOUGH MANY MODELERS choose not to become involved with scale models, most do have an appreciation of them. Usually thoughts of countless hours spent tediously assembling multiple pieces comes to mind; and those thoughts often are enough to frighten even the experienced modeler. Fortunately, numerous kit manufacturers today apply sound engineering to develop building shortcuts that allow scale models to build in little more time than the average sport model.

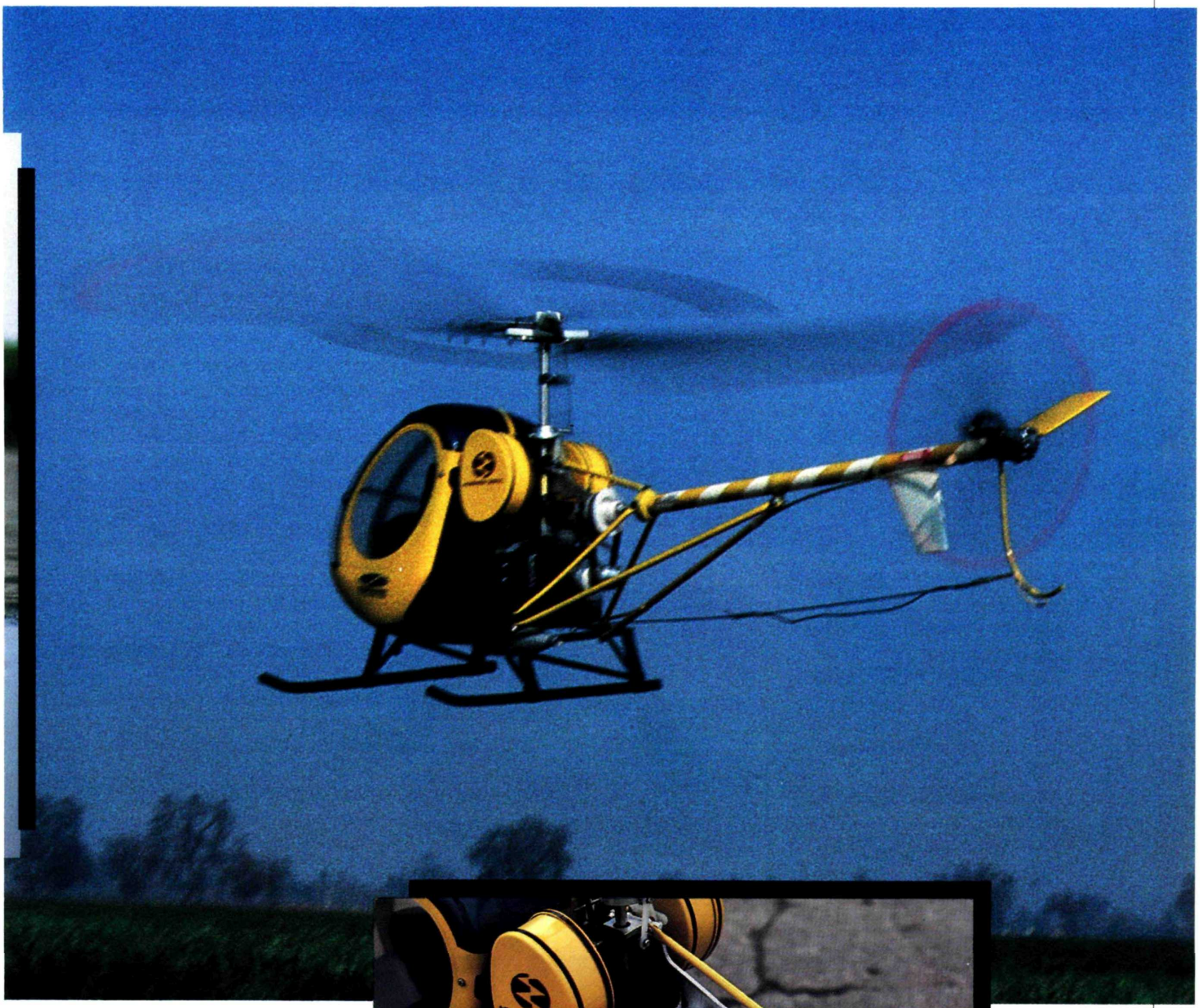
Most helicopters began life as scale ships in the early Seventies. Complexities of learning to fly these darn things were great enough, but add to this the downright intimidation of a gorgeous fuselage, and you can see why many early helicopter modelers never attempted flight. Today's scale-model helicopters offer the luxury of realistic appearance with little more assembly than the sport "pod and boom" types.

Personal continued success with Gorham Model Products* Cricket (*Model Airplane News* December 1985 issue) prompted a closer look at its cousin, the GMP Hughes 300. In designing the 300, John Gorham utilized many of the readily available Cricket parts while keeping to a minimum expensive newly tooled

components. The Cricket offers low-cost model-helicopter flying due to its small size, light weight and minimum requirements in both flying and transporting. Since the GMP Hughes 300 shares most components with the Cricket, it made sense to assume that it would also share these same positive characteristics. And it does!

THE KIT. My first impression, I was amazed at the small size of the box! Was there really a scale helicopter inside? Actually, yes, carefully packed and shoe-horned into the container there was the complete kit. As with the Cricket, all mechanical components are group packaged and numbered according to assembly sequence. The crystal clear canopy halves are protectively wrapped and almost serve as trays for the balance of the kit parts. All hardware is bagged by item.

Assembly instructions are usually the downfall of most helicopter kits—but not so GMP. Seven pages of assembly photos, an exploded view, and concise step-by-step written instructions accompany the Hughes 300 kit. Also included in this well-thought-out kit are a separate set of set-up, trimming, and flying hints completing the material.



Suspended tail boom looks complicated but assembles easily. Cooling fan and shroud are included.

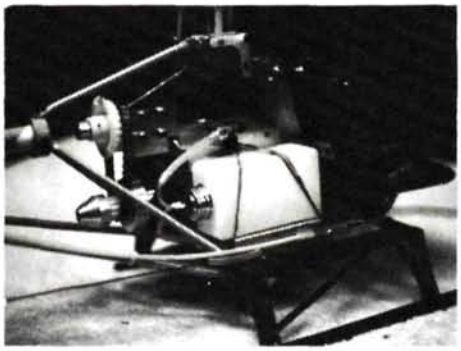
Docile and very scale-like in flight, the Hughes 300 handles basic maneuvers but not aerobatics.

A well-written introduction in the assembly instructions provides helpful information to assist in engine, muffler and radio selection. I found this section particularly useful, especially when needing help with the radio installation. The Hughes 300 can use engines from .25 to .40 but may require modification for the largest.

The radio compartment space is restricted by the moulded cockpit interior. To leave these components out would be criminal, so careful planning of the airborne installation is important. Most radios should fit though the larger servos will be snug. My Circus Hobbies* 6-H with the 505 servos dropped in with room to spare. A concession to scale appearance became obvious when fitting the Kraft* gyro: it had to rest on the seat.

ASSEMBLY. Assembly begins with the bulbous canopy since it must be painted for proper appearance. The only deviation from the instructions needed is to extend the trim length dimension of the canopy back opening about one-quarter inch for plenty of clearance over the woodwork. Masking and painting can begin as soon as assembly is complete and the finished canopy will fit perfectly.

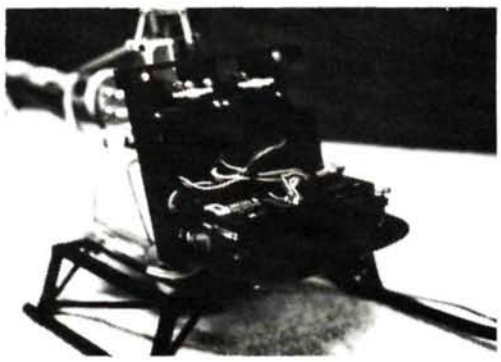
Small box contains huge assortment of numbered bags and instructions. Kit contents are first rate.

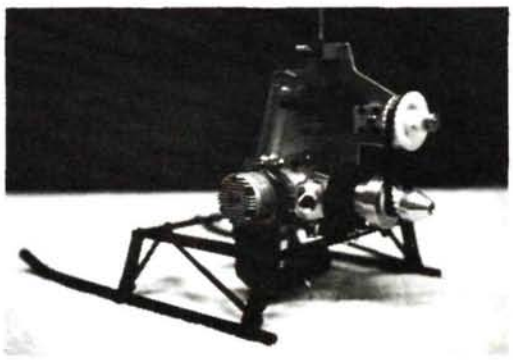


Visible tank and mechanics allow easy monitoring. Although exposed, mechanics remain clean.

While the above steps are taking place, mechanical assembly can also proceed. Pay close attention to the provided photographs while moving through each step. The main frame and multi-part scale landing gear can be confusing if you bully ahead. Studying the drawing for exact sequence will insure that all parts will fit together properly. Follow this with the rotor-drive gear train, which practically falls together. Allow play in the gear mesh as called for.

(Continued on page 111)





Right: Radios of most any size will fit. Far right: Basic pod assembly. Note toothed-belt drive.

Field & Bench Review

RPM CESSNA 40

Great-looking, ready-built basic aileron trainer.

by CHRIS CHIANELLI and STEVE SCOTTO

photos by LOUIS V. DeFRANCESCO JR.

Type: Trainer
Wingspan: 64 inches
Wing Area: 610 square inches
Weight: 6 pounds, 3 ounces
Power: .40-.45 two-cycles; .60-.65 four-cycles
Channels: 4

CONSIDER THE FOLLOWING. Scenario 1: Mike, a novice to R/C, sees hot planes and great fliers at a nearby field. Jocko, the local star, tells Mike he must build X trainer from the bottom up, as Jocko did back in '65. Mike also is wild about dirt bikes, and yet nobody tells *him* he must build one.

Scenario 2: Jocko kindly offers to sell Mike a complete trainer with the motor and radio ready to

go. Mike bites. Soon he's at the field with his shiny new plane. The problem is, poor Mike has no idea why the little box gizmos move the round part on the shiny thing up front. Wait till he tries to start it.

Scenario 3: Friendly Ray, the local hobby dealer, puts Mike onto a RPM* Cessna 40. Mike reads the directions, taking his time, and assembles a pretty decent-looking airplane. He also installs the motor and radio purchased from Bob's House of R/C Miracles across town. This process took Mike about six or eight evenings after work.

Now, which scenario of the three is most likely to result in a modeler who succeeds in a difficult hobby? Remember, not everyone loves to build. And I don't think they should have to. In case you're thinking scenarios 1 and 2 are wild exaggerations, they're not; I've seen them both occur plenty of times. It's a terrible waste of money and time for the beginner, and a needless waste of another potential modeler for the rest of us.

The Cessna 40 is the newest in the line of almost-ready-to-fly models from the RPM company. Now, the phrase ARF has been used around models for a few years. Well, take my word for it, no one has ever got-

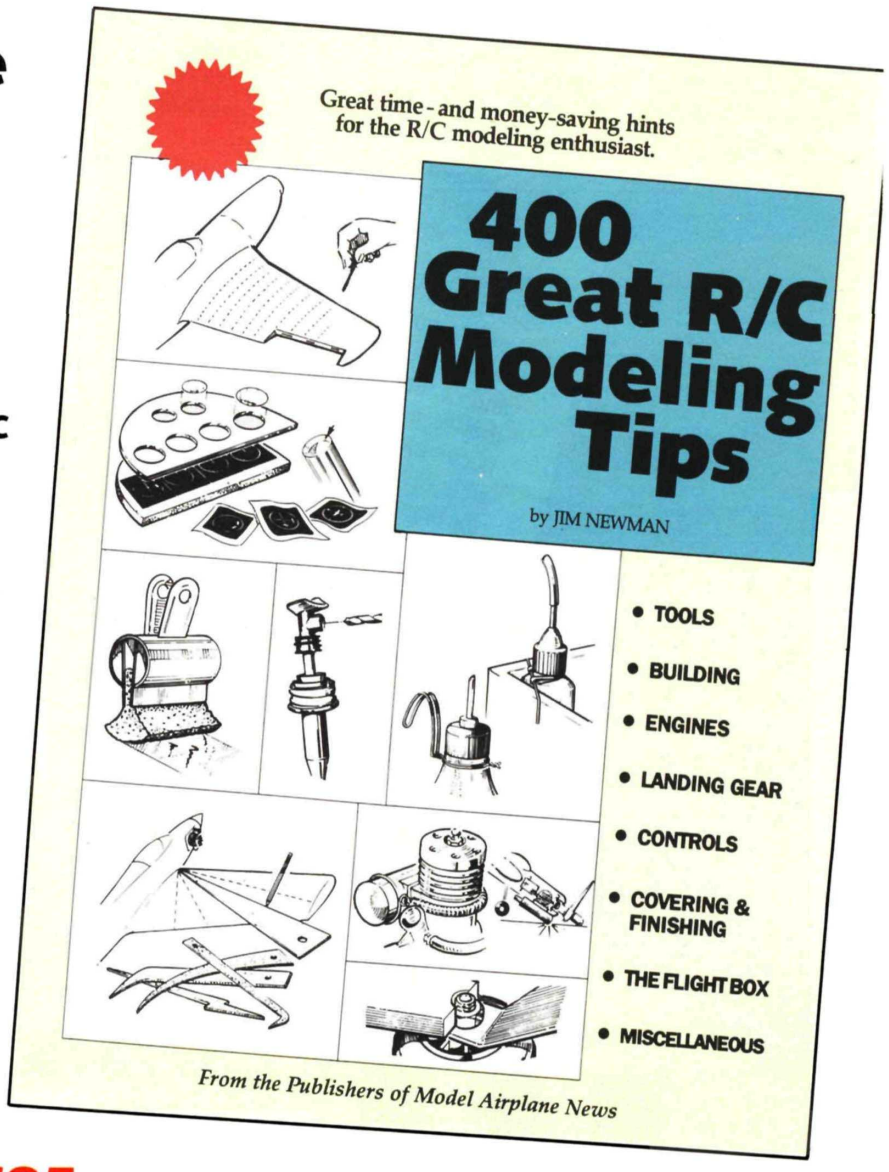
(Continued on page 106)

Our erstwhile exec editor prepares for another world-class sport flight!

The biggest selection of useful modeling tips ever made available to the radio control enthusiast.

by JIM NEWMAN

AN ALL-NEW BOOK from the publishers of *Model Airplane News*, **400 Great R/C Modeling Tips** contains a tremendous wealth of modeling tips for the radio control enthusiast. There are numerous time- and money-saving tips on building, tools, engines, covering, controls, landing gear, the flight box, and much more—all beautifully illustrated by the master, Jim Newman. These tips have been picked from the ever-popular "Hints & Kinks" column featured in *Model Airplane News* for over a decade. They're the innovative ideas of hundreds of modelers. This is one book the active radio control modeling enthusiast should have in his workshop and it's also great for the beginner. Order yours today.



Call 1-800-243-6685

203-834-2900 in CT

Please send _____ copies of **400 Great R/C Modeling Tips** at $9.95 each.

Name _____

Address _____

City _____

State _____ Zip _____

I have enclosed $ _____. Payment must be in U.S. funds.
Charge to:

☐ MasterCard ☐ Visa ☐ AmEx

Card # _____

Sig. _____ Exp. _____

For Postage and Handling: In the U.S. add $1.50 per book; foreign (including Canada and Mexico) add $2.50 per book. CT residents add 7½% sales tax.

Air Age Publishing Inc., 632 Danbury Rd., Wilton, CT 06897

Jet Blast

by RICH URAVITCH

WRAMs '87 *Fan lovers found lots to drool over at the '87 show.*

"Regal Eagle" by Paul Campanale is from a Bob Parkinson kit, which features balsa, foam, and fiberglass construction.

Eric Baugher modified this Violett Sport Shark. Looks like Mach II on the table. Viojet fan unit is used.

THIS YEAR'S WRAMS show, like its predecessors, offered its many visitors some nicely executed jet entries in the static competition. Overall, the number of entries was down, but the fan-powered machines were well represented. Interestingly enough, all the jet entries were built from kits, or semi-kits. Of the six total, two were entered in each of three categories: Giant Scale, Sport Scale, and Sport. Two of these took first place in their respective categories. There were more jets entered than the entire Non-Military scale complement. We're making great inroads, guys!

Mark Frankel first took place in Giant Scale with his Byron Originals F-15 Eagle. Mark said the effort involved six months of rather steady work but included modifications like an opening canopy and lots of surface detail. This 30-pound bird uses a pair of Byrojets turned by Rossi .81s. The choice of a development prototype paint scheme of air superiority blue with orange dayglo panels made this Eagle much more colorful than the production two-tone Lo-Viz greys. Mark plans on flying it reasonably soon, at least before the June Canadian Fan Rally, and I plan to be there for the first flight.

Right behind Mark, taking second place in Giant Scale was Bob "Playboy F-4" Fiorenze with his McDonnell Douglas F/A-18 Hornet. Remember that in the November '86 issue on the Canadian meet, I mentioned that I saw Bob loading some Hornet parts he'd purchased from Jack Tse into his car. Well, all dem parts done turned into one beautiful airplane. This 23-pounder gets its go from a pair of O.S. 77-Dynamax packages and, based on those I've seen fly, has plenty of smash. Bob, like Mark, opted for a preproduction paint scheme of overall white with blue and gold trim. Without question, modelers seek the WOW points of a show-biz finish rather than the mundane, varying shades of grey, or

Bob Fiorenze's FA18 Hornet in preproduction livery. Airplane took second in Giant Scale.

Another view of Fiorenze's Hornet. As always, Bob's finish was flawless and ship shows outstanding detailing.

Byron Original's F-15 Eagle by Mark Frankel used twin Byrojets turned by Rossi 81. Weighed 30 pounds.

green, currently used on military hardware. Bob says he purposely left off most of the surface detail, unlike his F-4, because he plans to sport-fly the Hornet. Sure.

Sport Scale representation in the form of Rafael Aguayo's Byron F-16 didn't go unnoticed. Rafael's Falcon was beautifully built, over a period of three years, and featured operating gear doors and speed brakes. It's powered by the popular Rossi .81 Byrojet package, which propels its 13 pounds in smart fashion. The finish scheme chosen was very accurate and, even if it was the boring greys I've mentioned, extremely well executed. It looked great and was a welcomed break from the usually seen A.F. Thunderbird scheme. I was told that it had been successfully flown, which doesn't surprise me because I've never seen one fly badly.

Also in Sport Scale was the niftiest little BAE (formerly Hawker Siddeley) Hawk to come down the pike. It's the airplane the RAF Red Arrows demo team currently flies. This model was built by Tim Farrell—it was originally a British kit—and then modified by him considerably. Tim chose a Rossi .65-Dynamax combo for his Hawk, which should go like the hammers as the ready-to-fly dry weight is only 7 pounds! Don't ask me how he did it. The camouflage paint looked good and the Aden centerline cannon pod added a nice military touch. Tim even incorporated the scale nose-mounted landing/approach light. It should fly soon.

In the sport airplane category, top honors went to Eric Baugher of Bowie, Maryland, for his modified Violett Sport Shark. It took Eric four months to get his hummer together including its Deltron finish, which was superb. The airplane is very clean, and probably capable of around 150 mph! This capability comes by way of its O.S. 77/Viojett power package. The choice of "Blue Angels" markings had many observers identifying the plane as a modified A-4 Skyhawk. Eric is no stranger to ducted fans as he has a scratch-built semi-scale F-4 which will be presented as a construction article in a upcoming *Flying Models* issue, or so I was told by their associate editor and good friend, Francesco Fanelli.

Finally, fellow Long Islander Paul Campanale displayed his newly completed Regal Eagle, a sort of F-15-ish sport fan kitted by Bob Parkinson of Canada. Paul spent three months getting this 10½-pound beauty ready to launch in the spring. The finish is white "Formula U" with red and blue trim a la T-birds or F-15 demonstrator. The 52-inch-span machine uses a Byrojet and could very well be an excellent fan trainer.

Congratulations, guys, and thanks for showing up to give other fan fans something to look at and read about.

The following were briefly seen. You'll be hearing more about them.

Bob Violett's long-awaited F-86F Sabre kit should be available as you read this. The quality is outstanding. Byron Originals Sport Jet looks like a shortened A-4 Skyhawk. For the guy who wants a jet but doesn't have to have scale. Nick Ziroli Models' new D.H. Vampire/Venom for Turbax/Dynamax fans. Glass fuse, foam cores; looked good.

And these final mentions weren't actually seen—but they will be....

Sterner Engineering sport airplane is patterned after the joint venture RFB Fantrainer from Germany. The prototype is Byrojet powered. Jet Model Products BD-5J originally was a Tom Sewell design, prepared for kitting by Tom Cook. The Air Force One is a 5-inch tandem-rotor fan unit that reportedly puts out over 18 pounds static thrust with an O.S. 77 turning 18-19 k. This I'm really interested in. Can you imagine?... Duke Fox's new fan engine is claimed to be at least a match for what's presently out there; and it's better than some.

For peak performance...stay tuned. ■

BAE Hawk by Tim Farrell was nicely built and finished in RAF markings; 7 pounds, Dynamax fan.

One of the nicest F-16s our author has ever seen was by Rafael Aguayo; was from the Byron kit.

Small Steps

by JOE WAGNER

Designed to look like a pre-war Navy fighter, the author's Screech Owl flies well with three channels.

IN MY PREVIOUS column I mentioned that I hadn't yet heard from any "Small Steps" readers. This isn't true any longer! I've received a lot of letters from modelers who've been flying since well before WWII to 13 year old novices. All this correspondence has been both enjoyable and informative, and I hope it keeps coming in. However, I'd appreciate the courtesy of an enclosed self-addressed stamped envelope with a letter asking for a reply. So does my colleague, Randy Randolph.

Many readers asked about plans for the models pictured with my columns. Unless otherwise noted, all of these are my own designs. I usually have plans available for them, but I have a personal quirk which prevents me from selling many of these plans. I'm simply never completely satisfied with any of my designs.

No matter how well they fly or how easy they are to build, I can always see room for improvement. There are better ways of building that don't occur to me until I've constructed a model or two from my plans. And new equipment keeps coming out while older stuff goes off the market. That's awkward for me because I always design my models comprehensively, including the engine, tank, and R/C installation.

The Veco Comanche free-flight model designed by the author in '51 makes an excellent ½A R/C project.

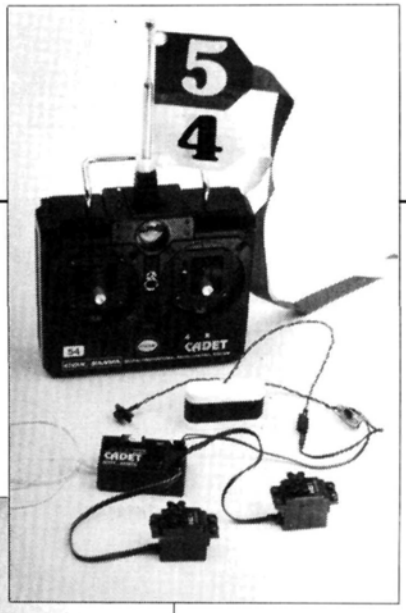
For instance, several readers wanted plans for the .020-powered gull-wing Storm Petrel. This model is a beauty in flight and isn't hard to build. Unfortunately, it was designed for the old Ace Pulse Commander radio system, which has been off the market for some time now. The Storm Petrel was designed to be the smallest package that would hold the pulse R/C gear, but there just wasn't enough room in it for digital proportional equipment.

Because so many people like the looks of this model, I've decided to enlarge the Storm Petrel a bit for .049 power and two-channel control. This will also overcome the limitations of rudder-only R/C, which are particularly noticeable on a clean, low-drag airplane like the Storm Petrel. Rudder-only R/C models build up speed in turns. When they straighten out, this extra airspeed causes the nose to rise, sometimes to the point of zooming and stalling. When that happens, with no elevators to level out the flight path, it can get kind of tricky to re-establish a non-erratic course.

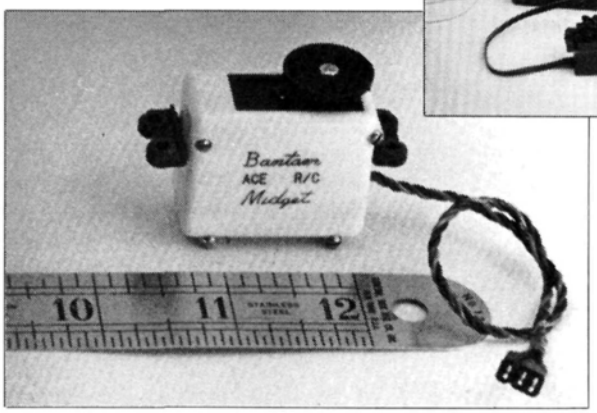
A few readers still remember my kit designs for Veco 35 years ago, and asked if they could perhaps be converted to radio-control. Several can quite nicely: the Sioux, the Commanche, and the Taylor Cub in particular. I know of a few attempts to make R/C versions of my best-known design, the all-sheet-balsa biplane Dakota, but none has been successful to my knowledge. The model was designed purely as a small-field, free-flight airplane and its aerodynamics don't seem to take kindly to attempts at control by radio.

However, I have a new all-sheet-balsa biplane design based somewhat on the Dakota configuration—and this one is especially designed for R/C. It will be published in this magazine sometime soon. Watch for it!

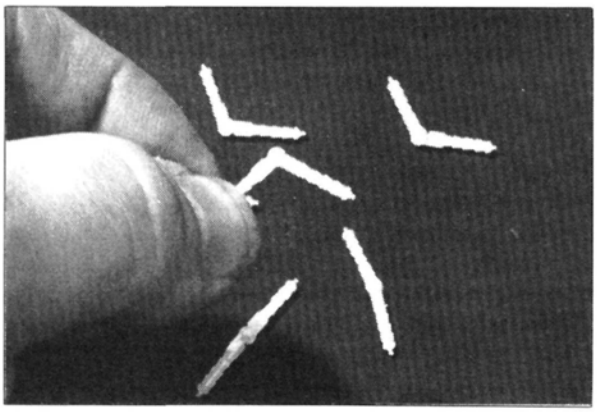
Meanwhile, I have full-size plans avail-



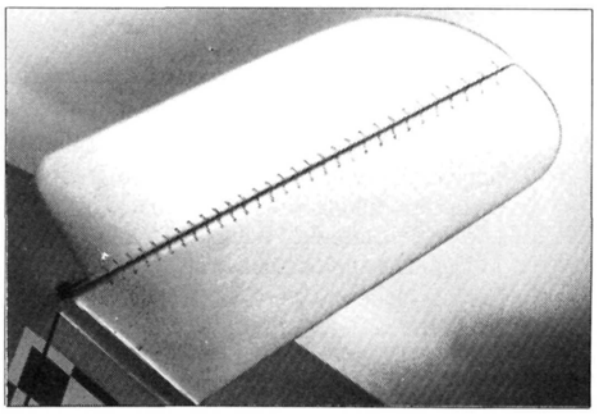
Cox Hobbies Cadet is an inexpensive two-channel R/C system with mini-servos.



Ace R/C's Bantam Midget servo is small, light, and inexpensive. Provides ample power and is the author's favorite servo.



Mini Hinge Points by Robart are tiny, friction-free, and ideal for small R/C models.



Baseball stitch hinging works well with minimum friction and leaves a tight surface gap. Nylon or Dacron thread necessary for long life.

able for my Veco designs; write to me for further information.

Several of you commented on the unavailability of many kits for small R/C models. I've noticed the same thing. In trying to obtain kits to review for this column I've been disappointed again and again. One kit I ordered way back in November was on back-order for over three months, and I just got it yesterday! Other kits seem to have been discontinued by their manufacturers, including a few of the best-flying ones.

Maybe it's because there's more profit in big, expensive models than in the small-size jobs, because there certainly appears to be a strong bias against the smaller and simpler R/C kits. If you agree, write to the manufacturers and tell them so. They won't know what we want unless we tell them!

Flyline Models* has a nice lineup of small R/C kits. They're good looking and fine flyers. Unfortunately, they're not very easy to build. For maximum lightness they're made of all-built-up construction, which I personally like. But it sure takes a lot of time to fit all the glue joints properly and perform all the assembly steps. For my own designs I usually go the sheet balsa route, for fuselages and tail surfaces, anyway. It's a little heavier than the all-built-from-sticks form of construction, but not excessively so with light wood, thin sections, and judicious sanding.

Let's look at a few of the minor problems that we fans of small R/C models encounter. First, have you noticed that just about all model airplane wheels are drilled for at least ⅛-inch wire, even the small ones? There's an easy fix for this; two, in fact.

One is to sweat-solder brass tubing over your small-diameter landing gear axles to fit the wheel hole. The second is even lighter. If your wheels have ⅛-inch axle holes, such as Ace's* new lightweight wheels do, drill them out with a No. 31 drill and press a short length of Sullivan's* semi-flexible Gold-N-Pushrod

(Continued on page 115)

Tech Tips

by RICH URAVITCH

Weathering Over Chrome MonoKote

Sporty Scale

The final result is lightweight and convincing, even though glassing, sanding, and priming have been eliminated.

Effective weathering is the pinnacle of the scale modeler's art, usually achieved through long hours of effort and lengthy experience in handling various materials. There is an easier way and that simpler system is outlined within this article.

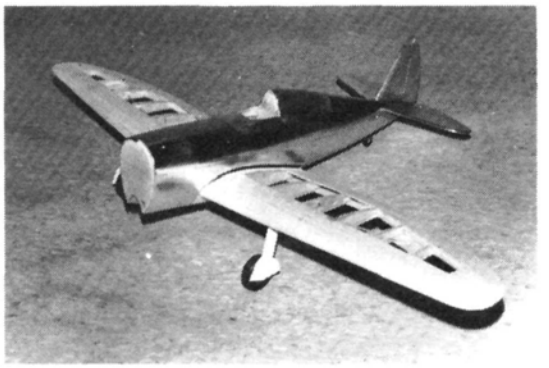
WAY BACK in June '84, when *Model Airplane News* presented the P-47 Thunderbolt, a number of you asked how the weight could be kept to 34 ounces while using paint and incorporating a "weathered" look. Things go slowly, but here at last we're writing our response.... The answer? Chrome MonoKote!...which also eliminates the need for glassing, sanding, priming and all those "smelly" things.

In order to gain a better understanding of the weathering process, we must first remove ourselves from the model world and think full-scale. Airplanes, especially those in combat, are subjected to some pretty harsh environmental conditions. During WW II, fighters on both sides were exposed to swirling sand, blinding rain, pelting hail, and lots of other decidedly uncomfortable conditions. On top of this, a war was going on, which meant the exteriors of the machines were not usually kept in pristine, museum-quality conditions. Thinking along these lines, try to visualize the effect of wind-blown sand on the painted surface, especially leading edges. How about the result of removing access panels repeatedly? Repairing projectile holes? All of these can be duplicated on your model. Visualization is the key.

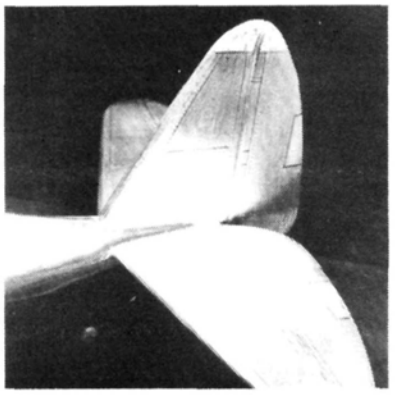
The first step in the process, after MonoKoting, is to completely paint the model, including the application of all markings. I use the Chevron "Perfect" camouflage flats for a number of reasons, their accurate color and soft, pliable make-up ranking among them. Having completed the paint application, allow 24 hours to dry and get ready to "age" the model. The tools required are rather simple...a number 11 X-Acto blade and some "000" steel wool. Start the process by using the X-Acto to remove paint along the various panel edges. The important thing here is not to be uniform or symmetrical, i.e., the left wing should not be exactly like the right wing!

Depending on the degree of weathering you desire, use the steel wool to remove some of the paint randomly from various

Techniques



Note subtle chips on the edge of panels and the wearing of paint on L.E. and fasteners.



Fuselage covered, wing awaiting. Note panel and rivet lines. Left, Chrome MonoKote surfaces are paneled, rivetted, and burnished prior to painting.

areas of the model. The leading edges always take the most abuse. When you get the effect you want, use a gray "wash" (80% thinner, 20% pigment) to add gun blasts, exhaust, staining, and streaking. When you're satisfied, shoot a coat or two of clear epoxy (flat or gloss, depending on the desired finish) or polyurethane to seal everything and impart an overall even finish.

Before embarking on this task, take a picture of your airplane, then take another when you're finished. Your modeling buddies will marvel at the difference! ■

Pattern Matters

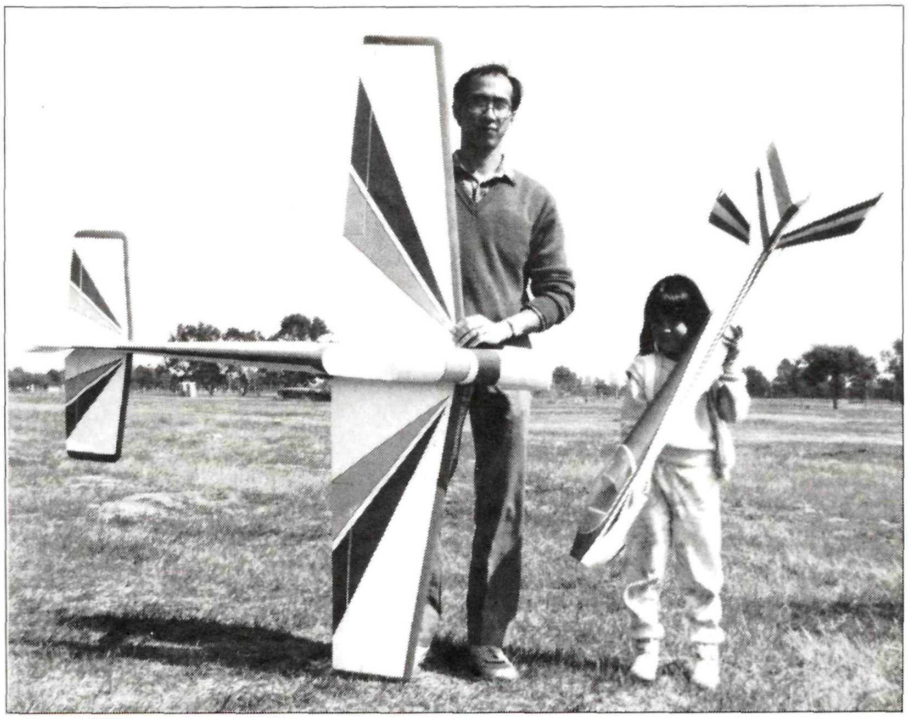
by MIKE LEE

IF YOU CAN remember sometime back, we had a talk with World Champ, Hanno Prettner. The conversation brought up several subjects, one of which was the change of the current FAI Turnaround schedule. I guess we're finally going to get our wish.

According to Ron Chidgey, the AMA representative to the FAI plenary group, a motion has been forwarded to the FAI about changing the flight schedules as of 1988. This new schedule is much more demanding than the current one, calling for some pretty tough maneuvers. For those interested, here is the proposed pattern schedule:

1. Take-off sequence.
2. Figure M with half rolls.
3. Half reverse Cuban 8.
4. Four-point roll.
5. Immelmann turn.
6. Reverse Top-Hat.
7. One and a half turn spin.
8. Square Horizontal 8.
9. Top-Hat with one quarter rolls.
10. Avalanche.
11. One half Cuban 8.
12. Triangle Rolling Loop.
13. Stall turn with half rolls.
14. Cobra Roll with 2/4 up and down.
15. Half Square Loop with half roll in vertical.
16. Six-sided outside loop.
17. Split-S.
18. Square loop with four half rolls.
19. Humpty Bump (Pilot's Option).
20. Reverse knife-edge.
21. Half Square Loop with full roll in vertical.
22. Three-Turn inverted Spin.
23. Landing Sequence.

Some of these maneuvers look pretty hairy, but it should be a lot of fun. I'll tell you, this new schedule is going to need some real power to perform. Ron said that this schedule will most likely be the final version. We're looking forward to it. I wonder if this column had anything to do with the changes?



Gene Chiao holds a Ten Plus Company ready-to-fly Supra-Fly while Melissa Lee holds a Cosmos 40 fuselage. Ten Plus is a new supplier of RTF pattern planes.

EZ-Supra-Fly

Getting down to some other neat Pattern things, I'd like to comment on the bird I've been flying lately. The EZ Supra-Fly from Hobby Shack*. Back in the April '87 issue, I did a review of the Supra-Fly, and mentioned that it was a great joy to fly. Today, some 150 flights later, I still feel that way. It's simply a great-flying pattern bird. I've flown the Supra-Fly in several contests and it has proven its potential as a first-line aircraft for Turnaround. Rick Verrano of Los Angeles has proven its potential. In the AMA Masters he took a convincing win at Mile Square Park against some nationally rated pilots.

It's not often that I write about the test birds I've flown, but I believe this one merits attention. After all, it's the first mass-produced ARF-type pattern aircraft to be made mostly of plastic and balsa. It's also the first ARF made to be marketed directly for the current pattern pilots. There have been other ARFs sold to pattern jockeys, but none in the quantity that the Supra-Fly has been.

The ship flies like a top-notch pattern bird should. She's straight as an arrow. She handles well, and is easy to fly for the Novice as well as other classes, and can get you in the action faster than any other ARF available for the price. I'd recommend the EZ Supra-Fly for pattern, along with Curare and its derivatives, and the Kaos through Dirty Bird series of ships by Joe Bridi. They've earned my seal of approval.

Ten Plus ARFs

Since we're on the subject of ARF or ready-built aircraft, I've recently discovered a new source of ready-to-fly pattern ships, as well as scale, sport, sailplanes, and others. The source is Ten Plus Company*, and the gentleman's name who runs it is Gene Liao. Gene recently brought a gaggle of his ships made from kits in Taiwan. His line includes the wooden version of the Supra-

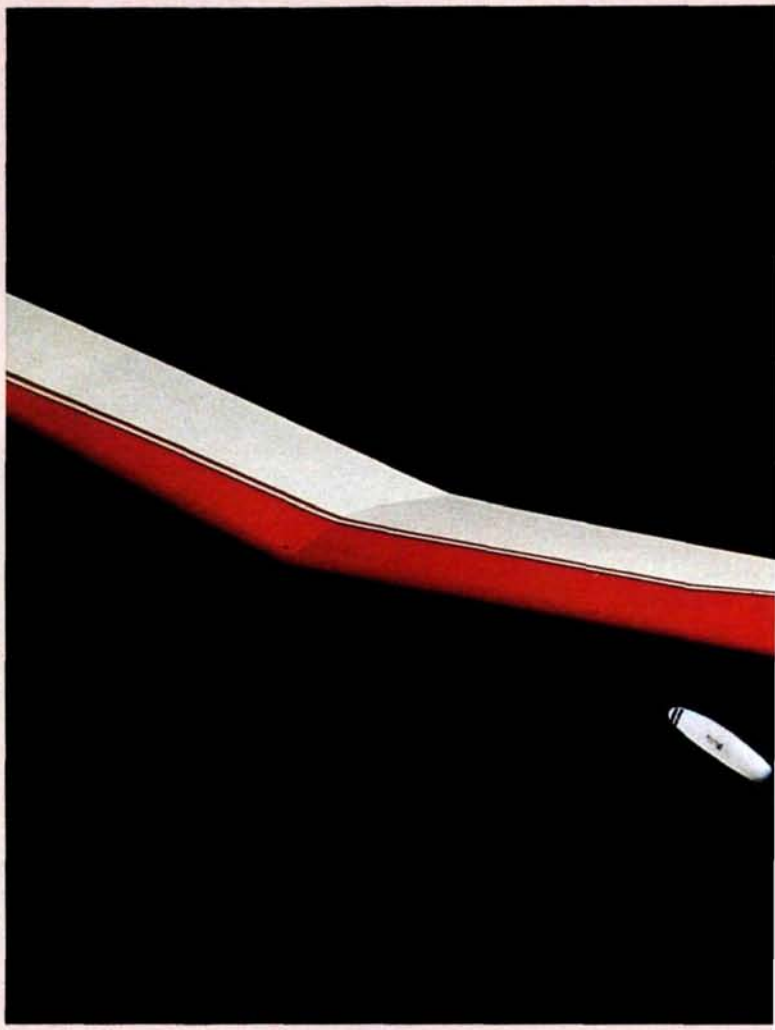
(Continued on page 121)

Carl Goldberg Models

ELECTRA

Aerobatic yet docile, this motor glider can soar with the best of them

by RANDY RANDOLPH



MODELERS ARE NOT NECESSARILY social animals. Most of us enjoy club meetings and visiting with other modelers, but the real fun in building is doing it in a quiet shop, alone! Sometimes it would be great to fly the same way without the long wait for the frequency and dodging other aircraft in the pattern once we have that elusive peg.

Flying after work without all the hassle of loading airplanes and cleaning up afterwards sure would be fun. How about a sailplane with a highstart, or wench, and the nearby playing field or school ground as a flying site? But, you say, by the time everything is ready , it's too dark to fly. Not if the wench is on the nose of the airplane—right where the Goldberg* people put it!

Electric-powered sailplanes aren't new, but to my knowledge this is the first time that a airplane and a good motor are both available in the same reasonably priced kit! And that battery pack in your car is just the fuel to send this graceful bird on its way.

The Electra isn't a Gentle Lady with a motor up front, but an airplane with the best from that old girl wedded to the best of electric propulsion.

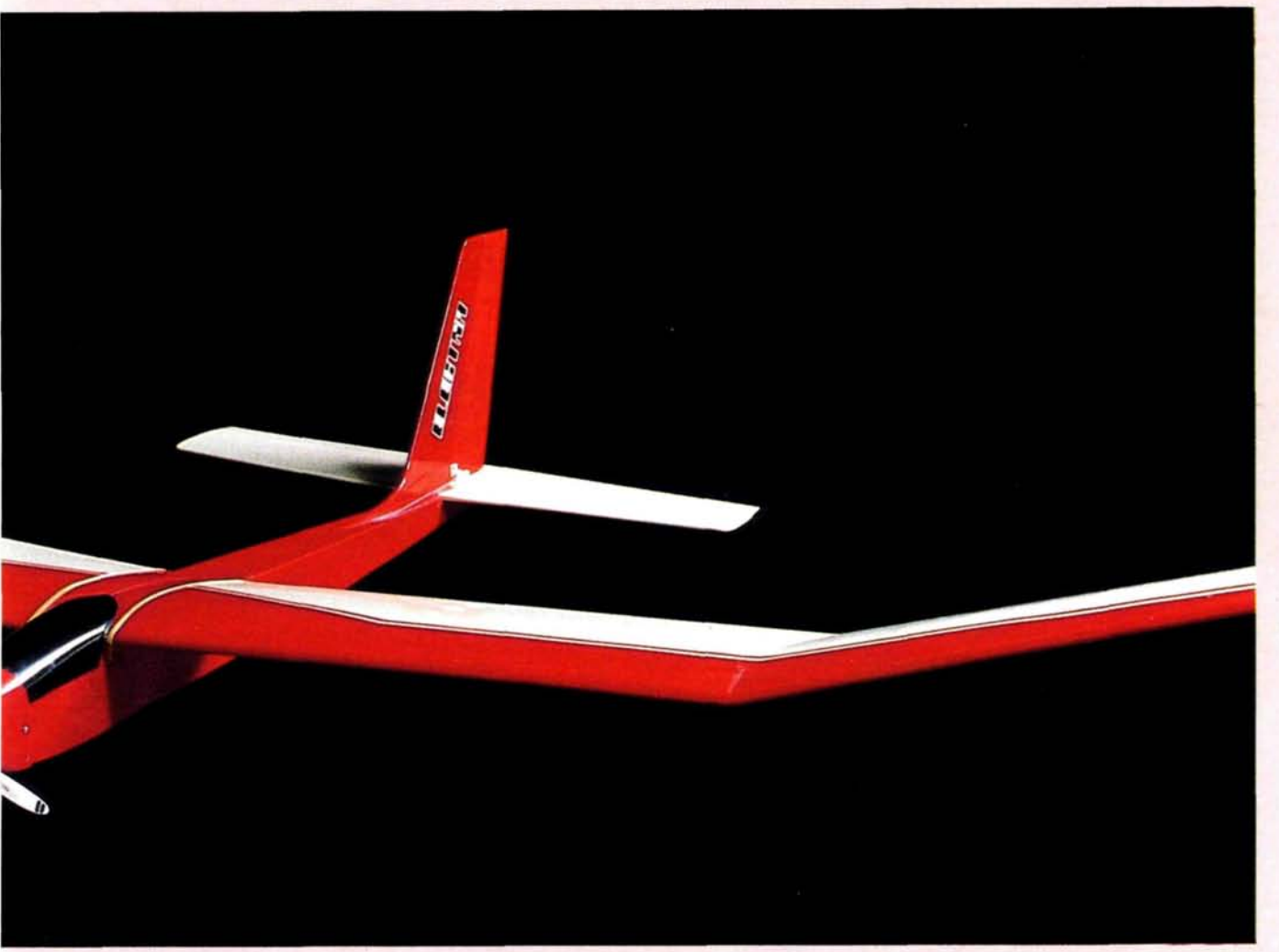
THE KIT is complete. But how often have you read "complete" on the side of the box and then seen it followed with a list of things needed to actually complete the project? For the Electra, you need glue, sandpaper and covering material, and a radio for control. Things like motor, motor mount, cowl, cabin, spinner, propeller, switch, fuse, servo mounts, pushrod hardware, hinges, control horns, clevises, etc. are in the box! Also included is the famous Goldberg tool for centering hinges, not to mention jigs to guarantee proper wing dihedral as well as a sanding tool to properly dress control surface leading edges!

All of the die-cutting is good and the parts fit. The wood is clear and attractive but a little heavy for my taste. Although some touch-up sanding is always necessary with die-cut parts, there wasn't a split-out or crushed part in the lot and they used real plywood instead of liteply.

The plans are typical of what we've come to expect from Goldberg Models, with lots and lots of instructions and exploded views. The 32-page, well-photographed instruction manual takes you through the sequence in fine style all the way from opening the box to final inspection and flying. There is much info about electric motors, which makes the manual handy even after the airplane is finished.

CONSTRUCTION is straightforward. The only addition I'd recommend would be a couple of ⅛-inch-square balsa uprights on the inside of the fuselage sides and a couple across the top and the bottom before the sheeting is applied. The grain of the sheet runs lengthwise to the fuselage on the top and bottom as well as the sides and the small strips of ⅛-inch-square could eliminate the wood splitting if the fuselage

Wingspan: *78¼ inches*
Length: *41 inches*
Area: *663 square inches*
Weight: *48 ounces*
Channels: *2-3*
Power: *.05 electric*
Wing Loading: *10.4 ounces per square foot*



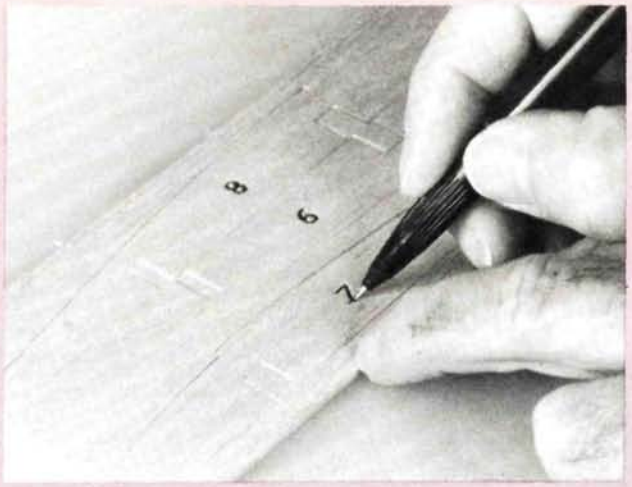
is squeezed too hard during a launch.

Since the Electra is a Goldberg product, it seems only fair to use their new Ultracote as a covering material. The stuff is great!—the easiest and most forgiving film I've ever used. I had been a MonoKote* and Micafilm fan for a long time, and now I'm a Ultracote, Micafilm and MonoKote fan. If Ultracote ever comes up with a transparent version, look out MonoKote!

I said earlier that the kit comes complete, but you'll need a .050 Allen wrench to mount the prop hub on the motor. That's the size furnished with wheel collars for 3/32-inch wire axles. The motor is held in its mount with rubber bands. The idea is to eliminate some of the bent shaft problems that crop up occasionally when the nose of the airplane contacts the ground at rather awkward angles! You and I never had that problem, but it's nice to know just in case.

Radio and controls installation was easier than expected. Rigging up the servo-actuated motor switch for the third channel was a piece of cake. When everything was in place and working, only a slight shift in receiver battery pack was necessary to bring the CG right on the button. After a couple of hot breaths from

Once up there, it's in no hurry to get back down!



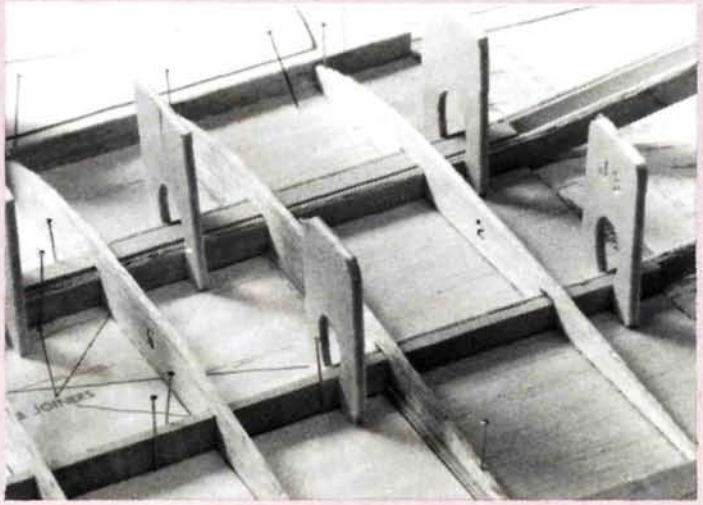
It is always a good idea to go over part numbers with a felt pen for easy identification.

the heat gun to add the called-for wash-in to the tips, it was actually battery charge-up time.

FLYING. This is a gentle airplane, not in the way of a beginner's airplane, but as a very relaxing type. It is stable and if the proper trims are clicked into the transmitter it will settle itself and do the flying for you !

The climb is also gentle. That doesn't mean that it won't get way up there; it will, sometimes on the same charge, but it does take a while to climb out and at times require a little nursing. The more the motor is run the better it works, for electric motors require breaking-in just like glo engines.

Once up there, it's no hurry to get back down. The prop is small and offers little extra drag as it windmills, it's almost as good as its Gentle Lady mother! It penetrates well, for this is not a light bird (3½ pounds), but with a wing loading of a little over 11 ounces per square foot, it isn't a bomb either. It's just relaxing...and fun.

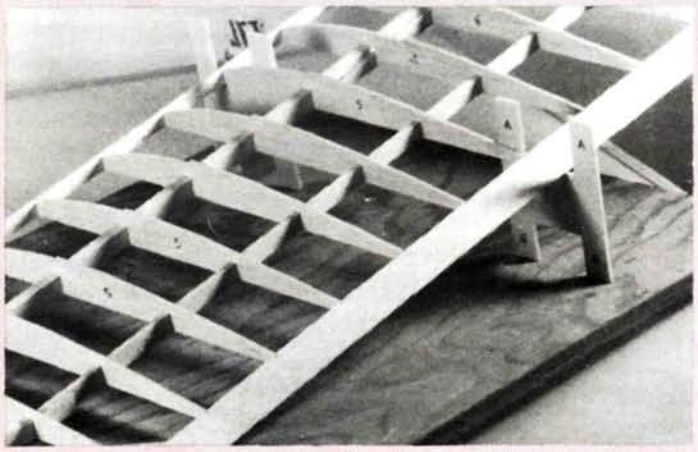


Gluing clamps are provided and help to align things. Another great Goldberg idea.

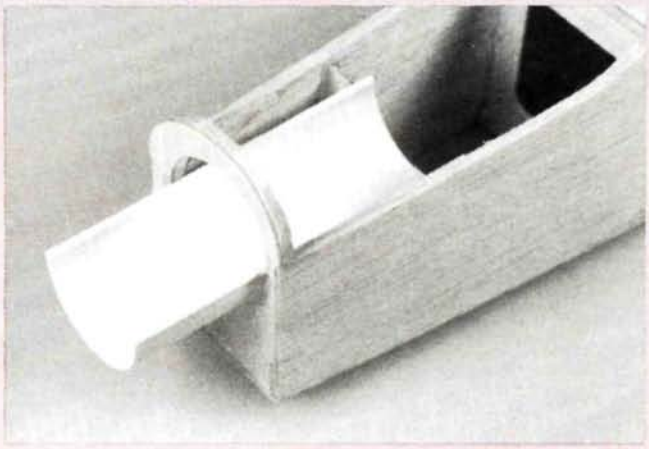
**The following are the addresses of the companies mentioned in this article:*

Carl Goldberg Models, Inc., 4734 W. Chicago Ave., Chicago, IL 6065.

MonoKote: from Top Flite Models, Inc., 2635 S. Wabash Ave., Chicago, IL 60616. ■



Double-ended jigs are provided to achieve the proper dihedral angle in each wing half. It's a lot easier than finding the right-size books!



Simple motor mount is easy to install and provides built-in right and down thrust.

R/C News

by ART SCHROEDER

I'VE BEEN INVOLVED in radio control for 37 years, and model aviation for even longer. I've come to realize that one of the strongest "glues" binding this hobby/sport together is the club newsletter.

I have no idea how many R/C newsletters are produced in this country, but there must be hundreds. One thing appears certain: those clubs with a newsletter are most active, do more for their membership, acquire and work at keeping flying fields, follow safer flying practices, work at training newcomers, are better informed and generally show more vitality than clubs without a newsletter.

Newsletters, of course, are used by all kinds of organizations and aren't unique to R/C clubs. I'm not sure which club started the trend, but I do remember the D/C R/C (District of Columbia) newsletter of the early Fifties, the KCRC Contacts (Kansas City) and the newsletter by the Chicagoland group. I also remember, with fondness, "The Printed Circuit" of my own North Jersey R/C Club. It was, after all, where I began my R/C writing as its editor.

Newsletters take several forms. Some are simple as a post card, some have several pages typed and reproduced, some are off-set printed with photos, cartoons and other graphics. All have the primary purpose of communicating with and informing the club's membership.

But some even try to instruct to improve each member's building or flying through articles written by more experienced members.

All perform a marvelous service to the members. And all, it seems, suffer a strange problem of getting little help from the membership/readership served.

It is the newsletter editor who is the real hero of this discourse. Without him or her (and often a spouse gets involved), the newsletters would not exist. The editor gives up hours of his personal building and flying time. To compensate for his lost hobby time, the editor gets to chase down material, write, type, run it all off, collate and mail all his efforts. He often does this with little recognition, support or even appreciation from his readers. Why do the editors do it? Probably because they recognize the importance of communication to a club's well-being. Editors also tend to be contributors to activities and not just receivers. They clearly care about their club and hobby.

Vow today to help out your editor by sending him some material he can use! Go up to him at the next meeting and offer your thanks for what he's doing for you. Or you might even ask him to lunch, in return for the modeler's *fete* he regularly prepares.

Strange how my mail sometimes contains similar problems from many writers. Recently, it's been hinges. Letter after letter has revealed problems in this area.

While surface hinges are not constantly on any modeler's mind, they should be given some thought since the safety of the airplane depends on this simple device. I don't care how well your radio works or how well your airplane flies—if enough hinges let go, it could be disaster.

Some correspondents wonder which hinge is best. Frankly, I've used most of them without failure—pin type, flex plastic, and MonoKote. I have, however, had failure at the hinge line resulting from faulty installation. Therefore, rather than recommend one manufacturer over another, I recommend that you select the type (heavy duty or normal) you need and then be sure to install it firmly.

Selecting the hinge is easy. If your airplane is .049 to .19, use a mini-hinge; if it is .20 to .60, use the normal size and if it is larger than .60, use the giant hinge.

If you use the flat-plate type, drill additional ⅛-inch holes in each half and install with epoxy into the structure where a slot has been prepared to handle the hinge. Adhesive will flow into each hole and bond to the wood structure, pinning the hinge in place. I suggest that you apply a bit of oil or vaseline to the actual hinge line to avoid having epoxy screw up its motion. Better, use silicone rubber as an adhesive; it won't cause flexing problems and will hold the hinge firmly. If you want a super-secure job: after the hinge is installed, install a pin (I use 1/16-inch dowel) through the structure and each hinge half. This requires some refinishing. I rarely use the method since I've had good results without them.

The barbed hinge (Robarts and Klett) requires drilling a hole smaller than the barb diameter in each of the mating surfaces, placing epoxy into the hole and forcing the hinge into place. I do not prefit these hinges since removal destroys some of the wood's holding power. I also prefer silicone rubber for installation; it works best for me. By the way, use only the steel pin Robart hinges; the cost isn't much more and they work best. A drop of oil on the Robart pin connection helps avoid hardened epoxy from getting in but isn't needed when silicone is employed.

MonoKote and, I guess, other plastic-film hinges are a snap to install and do a fine, long-lasting job. Cut 1x4-inch strips of MonoKote (enough of the 4-inch length to handle twice the length of the aileron, rudder and stabilizer hinge lines). Overlap these 4-inch strips by about ¼ inch on the adhesive side and iron them together. You'll have a strip that has adhesive on half of one side and half of the other. Make enough to complete your airplane.

(Continued on page 119)

Construction - Best Seller Series

by RICH URAVITCH

WAY BACK in the April, 1982 issue of Model Airplane News, *when we were just forming the "new look" of this magazine, we featured a construction article of my .15 to .19-powered T-6 Texan, a design which has gone on to become one of the most popular ever. In fact, I still receive letters from virtually all over the world from modelers who have built the T-6 and enjoy its "friendly" flying qualities.*

Since the problem of the ever-shrinking flying field has, to some, become more acute in the last four years, we thought we might revisit the T-6 as many of our readers may have missed its presentation and are looking for a small-field, sport-scale fun flyer.

I've reviewed the plans for possible improvements, re-read some of the letters and must conclude that nothing really needs to be changed. It's been flown with everything from an O.S. .15 through .30 Wankel and nearly everything in between. The new O.S. .20FP or K&B .20 Sportster might be just perfect. Looks like they'll fit right inside the cowl. Let's see, I've got a few minutes...could cut out all the ribs and tail feathers...humm?...

V

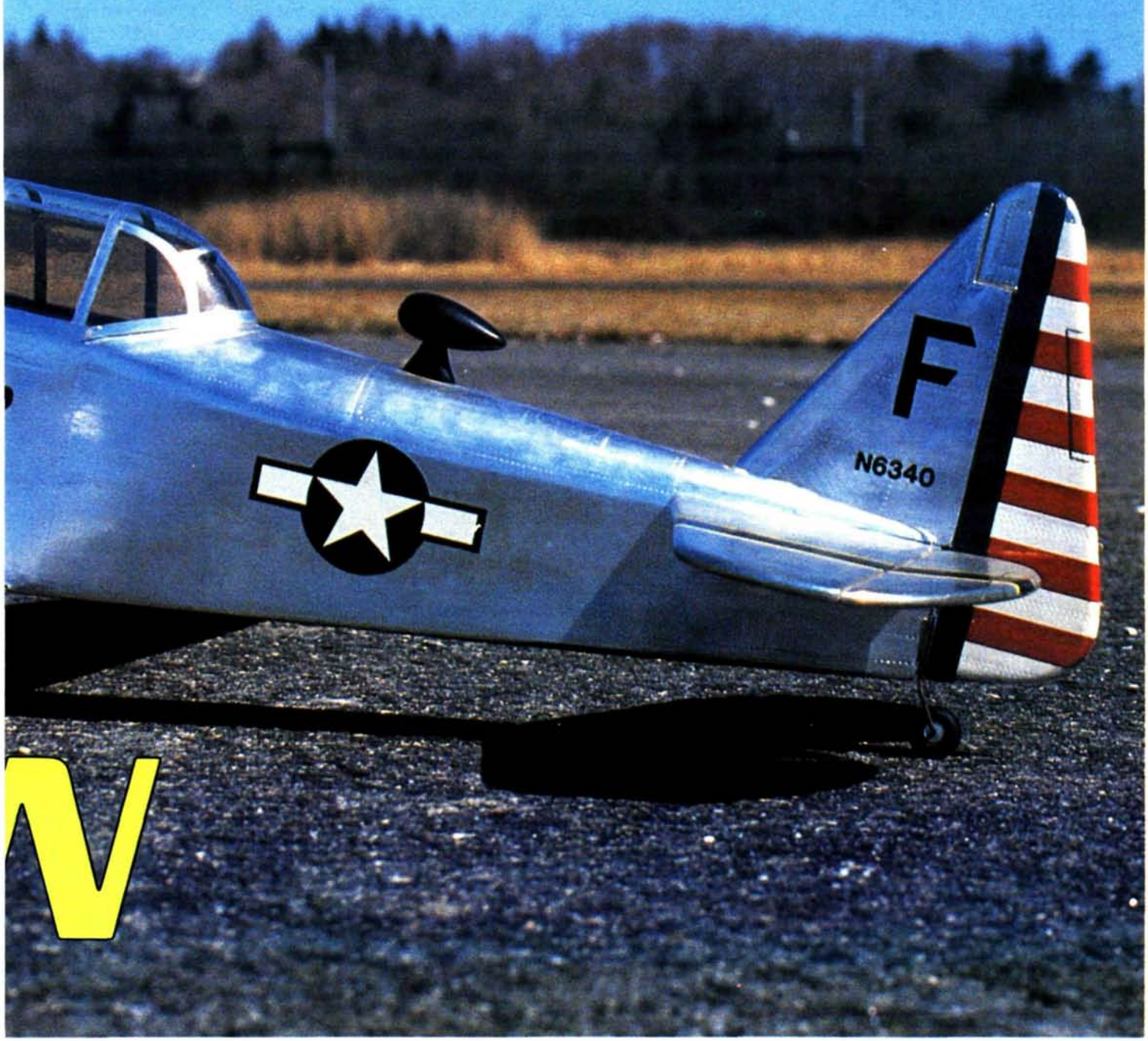
numb
The c
had ki
¼-sca
versio
he wa
disgor
record
strapp
a heck

T-6 TEXA

A super-flying easy-to-build .15-powered sport-scale ship.

HAT MAKES CERTAIN airplanes more popular han others? The popularity of the full-scale irplanes seems to be directly proportional to the /C kits of that airplane that become available. example of this is the P-51 Mustang. We have published designs ad infinitum, from ½A through *everything* in between—and that's only the R/C I see it, nearly every R/C scale enthusiast wishes driver and the cornucopia of kit manufacturers ne kits makes the fantasy happen. Let me set the ht—no one, full-scale pilot or R/Cer, ever a '51 and tweedle-dee'd around the patch without ot of prior time on something a bit more forgiving, which brings us around to the subject of this article, the T-6 Texan.

Well here's a new T-6 that represents the mini-economy-size end of the spectrum, but this one is scratch-built. It's .15 to .19 powered (except for you heroes who'll insist on stuffing a K&B 3.5 in the nose), will cost maybe fifteen bucks to build, and should be framed in about a week. (It took me two, but I had to draw the plans!) The design is actually a second-generation version of a T-6 I designed some years ago for quarter-midget racing...you remember, when an O.S. .15 and a House of Balsa Shoestring was the hot setup. Well, I guess we've come full circle becuse I've got that same O.S. in mine! I thickened up the wing, fattened the fuselage and simplified



photos by LOUIS V. DeFRANCESCO JR.

Although not 100% scale, the Uravitch T-6 leaves no doubt as to the aircraft it represents. Airplane is simple to build and simple to fly.

the construction. The model lends itself nicely, with minor changes, to also produce virtually any of the T-6's predecessors such as the NJ-1, BC-1 or BT-9. Dom Polumbo, a co-worker and frequent contributor to modeling publications, was enthusiastic about the design, took a set of my preliminary drawings and built a BT-9 version. He finished it in a typical pre-WW II trainer scheme of blue fuselage with yellow wings and tail group. The red-and-white striped rudder adds a nice splash of color. A very attractive and colorful variant, Dom's model is powered by an unthrottled Cox .15 and is flown three-channel. I'm sure that it could be very successfully operated as a two-channel airplane, eliminating the rudder.

CONSTRUCTION. The wing consists of a center section and two outer panels. The center section builds as follows:

When cutting out the ribs, I'd suggest that you make six W-2 ribs, pin them together and sand so they are all identical, then unpin them and cut the rear lower ¼-inch spar notch in four of them, which will give you the required W-1 center panel ribs. This procedure will assure you of an exact match when you join the outer panels to the center section.

After cutting out the remaining ribs, pin an 8-inch section of 1¼x5/16-inch shaped trailing edge directly over the plan (protect the plan with wax paper or plastic wrap—it cost you money!), and add the 1/16-inch balsa lower sheeting, the forward and aft lower spars, the four W-1 ribs, upper spar, and sub-leading edge cap. Now epoxy the hardwood gear blocks and balsa filler block in place, and add the top sheeting and leading edge. Voila!—you're finished. I hope that when you glued the outboard ribs in place, you made sure they were 90° to the building surface. The use of a House of Balsa "upright" makes this easy. If you didn't, epoxy jammed in the outer panels will work. I don't always get 90° either.

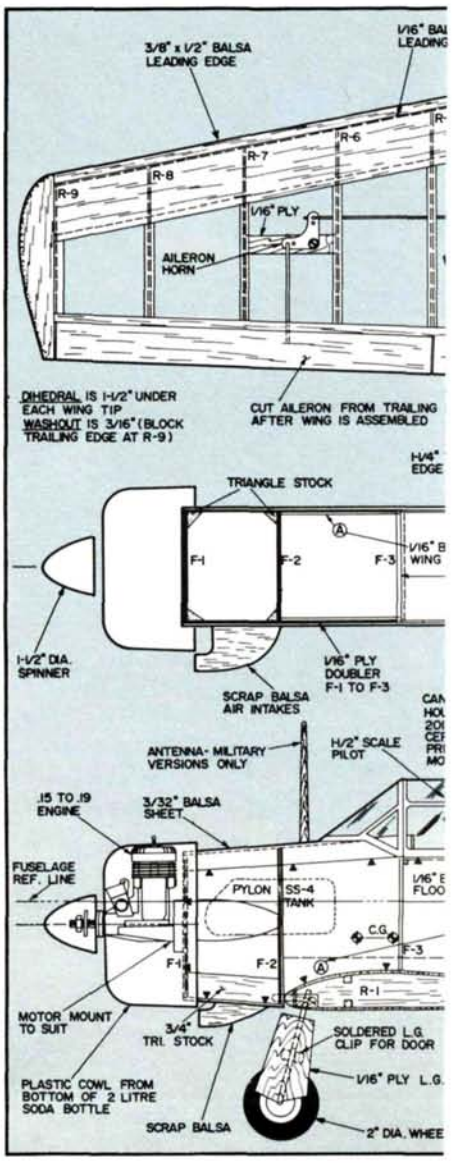
The outer panels are equally easy but must be built as follows.

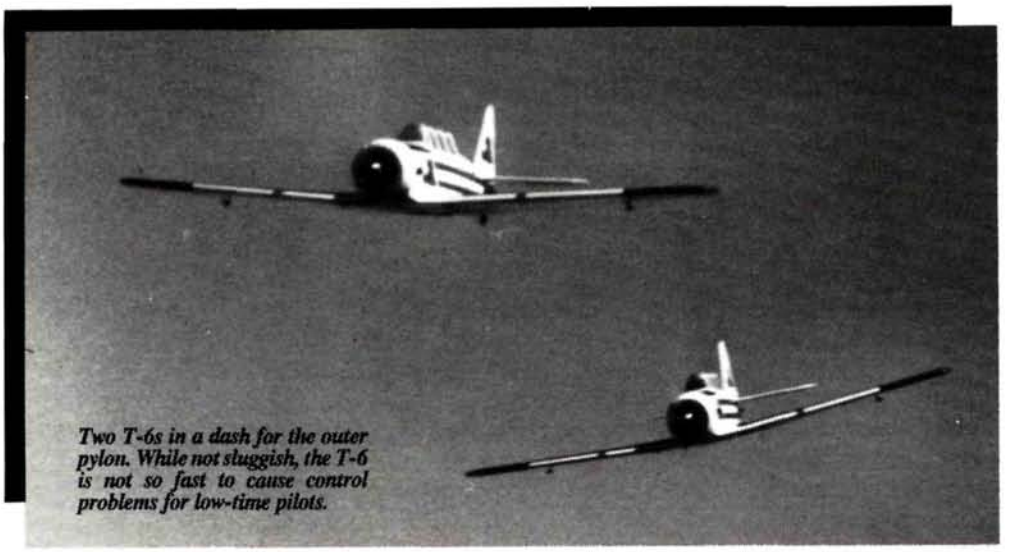
Pin T.E. stock and lower 1/16-inch balsa leading edge sheeting in place, cut and cement lower capstrings in position, and now add the lower spar and ribs W-2 through W-9. When attaching rib W-2, use the dihedral gauge to get the proper root angle, so you can match the perfect 90° you got in the W-1 section rib. Keeping the L.E. at W-9 (tip) and the root rib W-2 securely pinned, remove as many pins as required to shove a 3/16-inch shim under the W-9B rib at the trailing edge. This provides that magic wash-out everyone talks about. It's an aero term that mean "intentional warp." If it's in the proper direction, it can help! Finish up by adding the upper spar, sub-leading edge cap, leading edge, sheeting and upper capstrips. Let the whole works remain pinned to the board until completely dry, lest you lose the wash-out. Remove from

(Continued on page 75)

A duet of Model Airplane News' best-seller plans includes the Uravitch design T-6 and P-51 (plan #4832 for $11.50). Both aircraft are powered by .15 to .19 engines.

FOR ORDERING INFORMATION SEE PAGES 102, 103



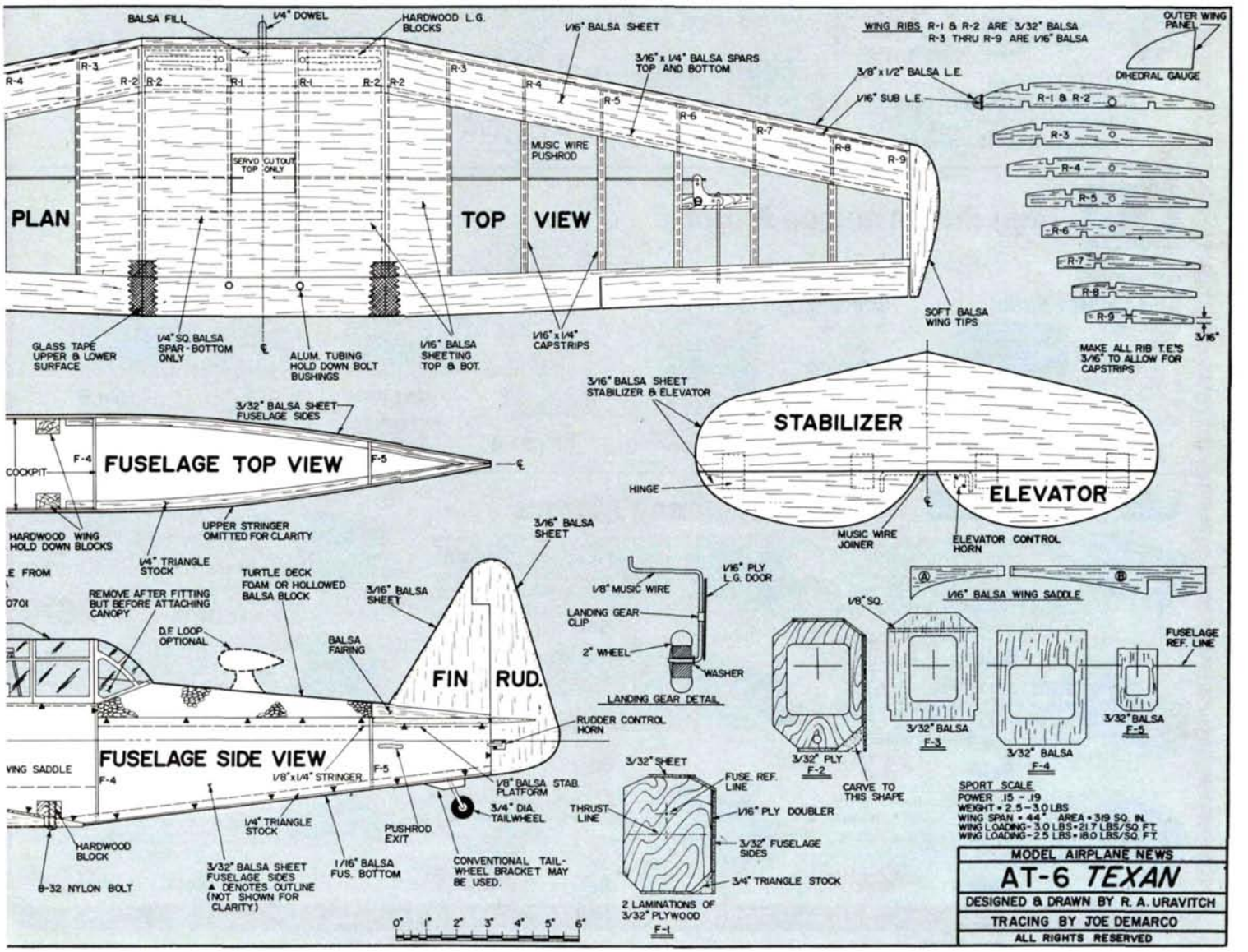


Two T-6s in a dash for the outer pylon. While not sluggish, the T-6 is not so fast to cause control problems for low-time pilots.

Order the Full-Size Plan!

#4821 T-6 TEXAN $10.50

An easily constructed performance-packed sport racer. Design is all-balsa, built-up, with a bit of foam for its turtle deck. Ideal for .15 or .19 engines.



T-6 TEXAN

(Continued from page 69)

the board, and add the tips and plywood bellcrank platforms. Delete platforms if you prefer a cable/conduit push-pull arrangement. Sand everything nicely, and epoxy the outer panels to the center section, blocking each tip to 1¾ inch. After the epoxy has thoroughly cured, apply 1-inch glass tape to the upper and lower surfaces at the dihedral break.

Cut the ailerons and don't lose them. Install your aileron linkage and temporarily hinge the surfaces. Whew! So much for the mainplanes.

The empennage (tailplane, horizontal and vertical stabilizers) is solid, light 3/16-inch balsa sheet, sanded to shape. Join elevators with 3/32-inch piano wire. Install the hinges.

There's nothing complicated about the fuselage. You can build it from the side view or directly (inverted) over the plan. I prefer the latter since different density sides can cause a twist that you'll readily detect. At the risk of sounding basic, start with a left-hand side and a right-hand side. The turtledeck can be carved from balsa or polyurethane foam. You can even make the turtleneck by using bulkheads, stringers and 1/16-inch balsa sheeting. Just watch out for sags between the bulkheads! Leave the lower nose sheeting off to make the next step easier.

For final assembly, position the wing on the fuselage and drill through No. 2 bulkhead into the wing leading edge to accept the ¼-inch dowel; drill through the wing T.E. into the fuselage-mounted hardwood hold-down blocks. Tap the blocks for 8-32 nylon bolts. I installed aluminum tube bushing in the wing for wear resistance. Trial-fit the tail group, making sure that everything is square. Leave the wing attached for this alignment. You now should have an airframe ready for covering.

Assemble all the parts, sit back, and admire. Then go out and celebrate! Go out and pick up a two-liter soda...and you see that plastic thing on the bottom of the bottle? It's your cowl. (You should be drinking a brand of soda with the plastic thing on the bottom....) Just gently remove the watchamacallit from the bottle, fit it to your airplane, sit back and finish your beverage.

You'll find adequate room for just about any radio you decide to install. You'll notice that I've put the tail wheel in the scale location on the white airplane. The linkage, in retrospect, wasn't really worth the trouble, but I've included a sketch to show you how it's done. The yellow (Navy markings) machine uses a conventional tail wheel bracket which is much easier.

The engine is mounted side-winder style, which allows the exhaust to exit the cowl downward through a Du-Bro* "Mini Mufflaire." This makes a nice neat installation with only the tip of the glowplug showing through the right-hand side of the cowl.

Final-sand the airframe, brush on a coat of Balsarite and apply your favorite covering. I used MonoKote on both prototypes, and the ready-to-fly weight was less than 42 oz for each model. Scale documention and super color schemes for the T-6 abound...just pick one that you like, or dream up your own, and press on.

Add remaining linkages, wheels and whatever else you like (don't forget your Williams Bros. pilot) and *balance* the airplane. Use the forward CG location for your intitial trim flights and gradually move it aft for snappier performance. Balance the model in roll also. This is just a check, since there really shouldn't be much variation unless you used steel ribs on one side and balsa on the other.

T-6 TEXAN

I'm not going to say, it's a trainer, because it is not. Nor will I say, it's easy to fly, although it is. I will say, however, that it is a lot of fun, looks terrific in the air, and is economical as the dickens to enjoy. Why not take this thing on as a club project? Build a half dozen, and if you all show up at the field at the same time, do some impromptu, non-regimented racing! I'm not going to suggest rules; if you do race, make up your own. I had intended to propose this as a new class of racing to get sport fliers involved, but historically R/C racing has always ended up as a specialized, megabuck proposition with the newcomer dropping out before he can, or cares to, compete against super engines and ultra-specialized airframes. If you doubt it, tell me how many Formula I ships you've seen being sport-flown recently? I do think, however, that it could be fun, cheap sport-racing built around a one-design concept. You readers in the U.K. might try adopting your club 20 guidelines!

So dust off your old O.S. or Enya .15 or .19, or whatever, and go out and have a ball. We're just getting things rolling with this possibility of T-6 racing. And for those of you who don't want to scratch-build the T-6 Texan, House of Balsa* now makes a kit, and a canopy as well.

**The following are the addresses of the companies mentioned in this article:*

Du-Bro Products, Inc., 480 Bonner Rd., Wauconda, IL 60084.

House of Balsa, 20134 State Rd., Cerritos, CA 90701. ■

HOVERING

(Continued from page 43)

expect to turn, then you'll never be surprised. If the engine doesn't start, raise the idle trim and try again. A well-adjusted engine should start and idle below the speed at which the clutch engages.

In the next section I'll discuss the initial run-up of an untrimmed machine. If you had a local expert set-up the machine many of the following steps will have already been done.

After starting the engine, place the helicopter down, facing into the wind. Make sure the gyro is turned on. Position yourself about 12 feet behind the machine and about 3 feet off to the side. The next job is to check the blade tracking. Adjusting the blade tracking insures that each blade produces the same amount of lift. The procedure is best carried out with the machine in a hover but a reasonable job can be done with the machine on the ground.

Slowly advance the idle trim until the clutch engages, then gradually advance the throttle until the helicopter starts to get light on the training gear but not so much that it starts to skid across the ground. Monitor the vibrations of the machine as the rotor turns up. A properly balanced machine may have some vibration as the rotor winds up but it should disappear at hovering speed. If the machine has excessive vibration, shut off the engine with the idle trim lever and let the rotorhead come to a stop. Check and make sure the main and tail rotor blade bolts aren't so tight that the blades can't swing. The bolts should be tight enough so the blades don't flop around but not so tight that they can't be moved easily. Restart the engine and try the run again. If there still is excessive vibration, stop the engine, go home and recheck the balance of the rotors and the straightness of the shafts.

Once the rotor runs up with a mini-

(Continued on page 79)

Giant Steps

by DICK PHILLIPS

WE TECHNICAL SERVICES* is well known in the hobby, especially to those who have been around for a while. This company has been designing models and assorted accessories for many years, and they have some good things in their stable. I recently received a couple of sheets of information from them and one idea makes particularly good sense. If you have a number of models and a limited number of engines, this idea could make your life a lot easier.

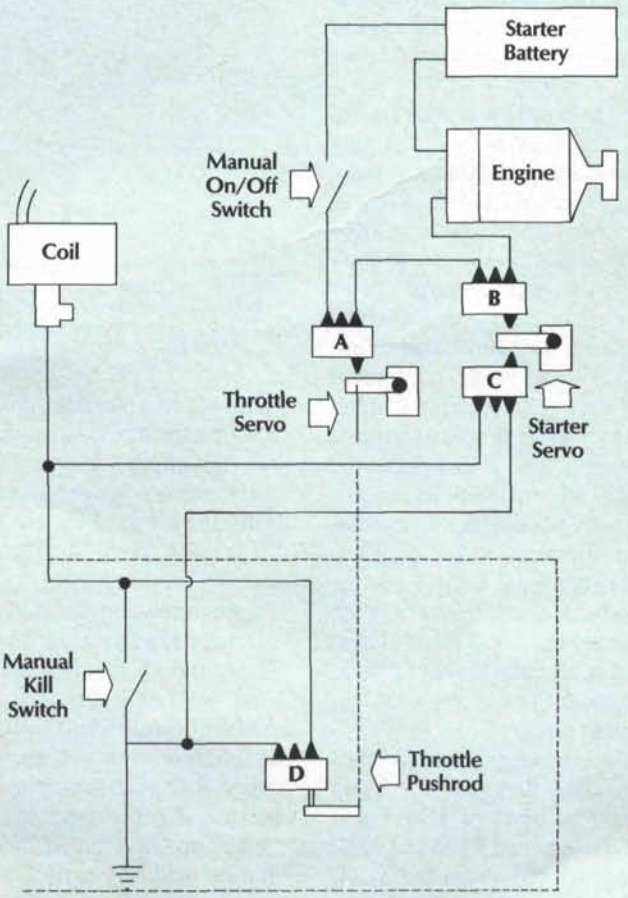
WE Technical Services has a universal motor mount which enables one to use a single engine in a number of different models. The mount has to be integrated into a model at the time of construction, but this should not tax the abilities of those who have some building experience.

Basically the assembly consists of a motor mount, fuel tank, throttle servo, and cowl (the cowl is available from Fiberglass Master*). The assembly is designed to be inserted through the firewall in any model, and is held in place by bolts and T-nuts (blind nuts). That part of the assembly which fits through and behind the firewall contains the fuel tank and throttle servo. It's a simple matter of inserting the four bolts and connecting the throttle servo lead.

The engine is shown mounted upright, but it wouldn't take much to reverse it should you wish to have it mounted inverted. The same thing applies to the cowling, which could either be reversed or replaced by a cowl suitable to the model. In addition, the assembly can be used as a test stand for running engines out of the model as well.

WE Technical Services will send you a blueprint of the mount, giving all dimensions and hardware required, in return for a dollar bill sent to the address at the end of the column. Looks like a good idea to me and one which will permit better utilization of a limited number of engines.

The company has also released



MICRO-SWITCHES

A. Idle Start Switch: Normally Open, closed only at idle. Prevents engine start except at idle. Should have extended spring arm to permit overtravel past "idle" without damage to switch.

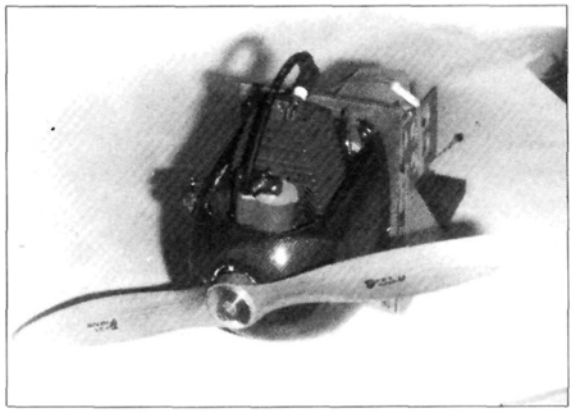
B. Start Switch: Normally Open, closed when "start" command given by starter servo.

C. Kill Switch: Normally Open, closed on "kill" command from starter servo.

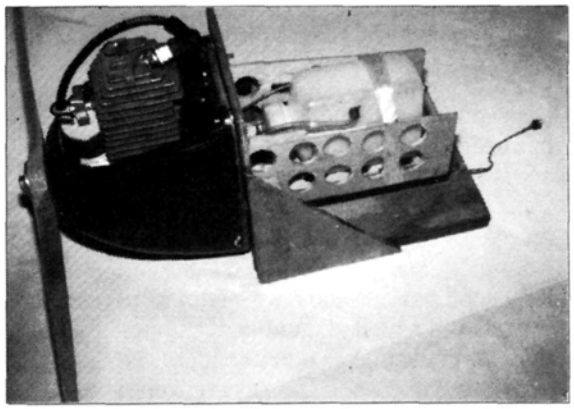
D. Throttle Kill Switch: Normally Open, closed by low throttle trim.

Note: Switches C and D are not both necessary as they accomplish the same purpose. Switch D would be used by itself on a no-starter installation.

another new plan to extend its stable. If you tend to like airplanes with two wings which were flown in the '20s and '30s, you'll like this Curtiss Falcon. Designed for the Q35 (or Q40) engine, this model spans 114 inches and tips the scales at 13 pounds. The wing is a flat-bottomed Clark Y and a complete plan and pattern set are available. At ¼-scale, the Falcon will make an impressive model. Four radio channels are required.



Universal Quadra engine mount. A plan is available. See text for details.



Another view of universal Quadra engine mount. Switches easily from model to model.

Pre-Flight Check

How often do you check your airplane for safety? No pilot of a full-scale airplane would take off without a pre-flight check. Regulations require such checks before commercial flights, so what makes you think your model is immune from problems?

I'm amazed at how few people range-check their airplanes before a flying session, let alone doing it frequently under harsh conditions. What harsh conditions, you ask? Well, how about a dark-colored airplane sitting in the hot sun? If you don't think that's harsh, put a thermometer inside it, let it sit in the sun for a while, then check the temperature. You might be surprised. All electronic equipment has a range of temperatures within which it is designed to operate properly. In most cases, these ranges are spelled out in the printed material shipped with the equipment. It's not only possible but likely that the operating temperature for your receiver will be exceeded if it is mounted in a dark-colored model and left to sit in the sun for any length of time. The result can be anything from slightly "flakey" operation to complete failure of the receiver, servos, or battery pack.

The solution is to keep your airplanes in the shade when they are not being flown, use lighter colors of covering if possible, and be aware of the potential danger of heat-related radio failure. If there is any doubt in your mind about the condition of your radio equipment, range-check frequently and at the first sign of anything out of the ordinary, stop flying until you figure out what's wrong.

What else should be checked? Inspect your propellers and discard those which show *any* signs of damage. Nicks, cracks, or any visible damage are reasons not to use a prop. If you use multi-bolt hubs, check the bolts any time the prop contacts anything but the air. If your prop touches the ground or anything else, remove the bolts and check them. If they show any sign of damage, or if they are stiff to remove or replace, throw them away and replace with new bolts. (You do carry a spare set in your field box, right?)These bolts might not shear right off, but they can partially shear, which creates a weak and therefore dangerous condition. If the bolts are difficult to remove or replace, there is a possibility they are partly sheared. Replace them.

Less likely, but possible, is damage to nylon or plastic wing hold-down bolts. These should be checked from time to time and replaced if they are at all doubtful. Same thing with strut and wire attachment points. Check them before every flying session to assure they are solidly attached and that there is no "give" or "slop" in them. Any such lost motion will be worked upon by flight loads and such conditions *always* get worse, never better.

Check all control surfaces for any lost motion. Any slop in a control run can have disastrous effects on flight. Here again, the flight loads will work on any such slack and will only make it worse. The time to assure that such slack is eliminated is during construction, of course, but if it crops up after construction, better find out why and correct the condition.

Ailerons are particularly subject to damage if there is slack in their control runs. They will flutter in flight, especially at higher speeds. Aileron flutter can separate the ailerons from the wing in a few seconds, with rather severe consequences.

Check control surface hinges during your pre-flight. If they show any sign of binding, looseness, or misalignment, don't fly until the condition is corrected. Any rubbing of control surfaces on other parts of the airplane should be corrected. This can be as simple as folding a piece of sandpaper with the grit sides outward and sanding lightly in the slot until the friction is eliminated, or it may require some additional shop work to correct.

Fuel tank connections should be checked for integrity. Any loose connections (or doubtful ones) should be secured before any flight is begun. When fueling, if an inordinate amount of fuel seems to be required, stop immediately and check for leaks. Do not permit smoking or open flame anywhere near fueling operations. This applies to all fuels, but is particularly important around gasoline. Fuel tanks should be mounted where they can be checked easily, but this is not always possible. If a tank has to be mounted where it will be inaccessible, make doubly sure that all connections are secure. If the tank compartment is sealed off from the rest of the airplane, coat the inside of the compartment with glue or fiberglass resin. Provide a drain hole at the lowest part of the compartment. If

(Continued on page 112)

HOVERING

(Continued from page 76)

mum of vibration, adjust the rudder trim until the machine sits straight without any tendency to spin around. The next step is for you, or preferably a friend, to get down on the ground at least 10 feet from the machine. Place an eye at the level of the rotor disc and look at the tips on the outer edge of the rotor disc. Ideally, you should see one blade. Most likely, you'll see two blades. This occurs because one blade is generating more lift than the other, and thus flexing more. Determine which blade is running high by noting the color of the tip. (You did put a contrasting color on one blade only.) Stop the engine. When the rotor comes to a stop, adjust the pitch link of the lower blade so that it will have a higher angle of attack. The higher blade can also be lowered. On fixed-pitch machines, bend the blade mounting straps slightly with a pair of pliers. Repeat the run-up and tracking procedure until only one blade is seen.

Once the blade tracking is set, engine adjustment can be performed. The carburetor should be adjusted so that the motor idles well and smoothly accelerates to hover speed. The idle may need some minor adjustment to achieve this. The main needle valve is correctly set when there's a nice trail of smoke coming from the muffler. The engine and collective pitch should be adjusted so that the machine wants to lift off at half stick, and the rotor should be at about 1,650 rpm. You'll quickly develop an ear for the correct sound but an optical or audio meter is very helpful when setting rpm. Fixed-pitch machines should also be set up so that they lift off at half stick.

After all these things are set, you're ready to attempt your first training exercise. While standing as described above, the rotor is brought up to the speed where the machine is light on the training gear but won't take off. Practice turning the helicopter to the right and left with the rudder control to get used to using your left hand. Never let the machine turn more than 90° to either side or let it off the ground. If you get into trouble, reduce the power and let the machine settle down. If the training gear was constructed properly, the machine can fall about 3 feet with minimal or no damage. Try to get into the habit of reducing the power slowly, which settles the machine gently. Once you are comfortable with the rudder function, continue to advance the power until the machine leaves the ground, then reduce the power slightly so it won't climb too high. Try not to let it get more than a foot off the ground. If the machine is in proper trim, the ground is level, and the wind very light, it should be in stable hover. If the machine is out of trim, it will want to slide off in one direction or another. Set the machine down and adjust the trims so the machine doesn't want to wander too much. By this time you'll know the meaning of "going out for a test hop." If there's any wind, it should be compensated for with the trim. If your flying field isn't level, the machine will have a tendency to act a little like an air puck and slide down the grade. This must be taken into account. This phenomenon is called "ground effect" and occurs within 1-2 rotor diameters off the ground. Ground effect also occurs because at low altitude the column of air that supports the helicopter bounces off the ground and recirculates back through the rotor, affecting its stability.

Continue to make short, low hovers while trying to keep the machine stationary and level. If the helicopter moves to the right, give a gentle command to the left, and so on. If you do get into trouble, reduce the power and let the machine land. When first learning to hover, most of the damage to the machine occurs from tailrotor strikes, which occur when the machine is set down and tipped backward. Always try to set the machine down level or tipped slightly forward or sideways. If a tailrotor strike occurs, stop the engine and check the tailrotor, tailboom, and drive system (especially the plastic main gear) for damage.

Now I'd like to take a moment to relate some functional control differences between the different directional control systems and the vertical properties of different types of machines. A machine with Bell-Hiller mixing will be easier to learn on than one with only Hiller control. The Bell-Hiller machine will react more quickly to control inputs than will a Hiller-only system. When flying a Hiller-only machine, the control inputs must be made earlier and stopped sooner than with a Bell-Hiller system. This necessity to lead the control inputs by trying to anticipate the reactions of the machine just as they begin to happen, can be a problem for the beginner. The same arguments apply to fixed-pitch machines versus collective-pitch machines. In fixed-pitch machines, the whole rotorhead must be accelerated or decelerated to climb or descend; which takes time, so again there will be some lag in the machine's response to control inputs.

When one first starts learning how to

(Continued on page 82)

Soaring News

by JIM GRAY

THE WORLD R/C Soaring Championship U.S. Team (F3B) needs your support. Please send your contributions to the United States of America R/C Soaring Team F3B, P.O. Box 9328, Albuquerque, NM 87119 or call 505-884-9635.

Thanks to the South Bay Soaring Society Newsletter, March 1987 issue, we bring you a three-view and specifications of Synergy II, the probable U.S. Team sailplane. The first practice contest in California showed promise of this design. Another practice sailplane is the German Comet which has good performance and makes an excellent "trial horse." The U.S. Team will get to have a second practice contest in New Mexico and a final one in California before departing for the World R/C Soaring Championships in Osnabruck, Germany, this July. By the time you read this, the Team will

Cliff Charlesworth and his vintage ¼-scale MU-13D Atalante. All photos by Sean Walbank.

be on its way or already there. Go get 'em, Team!

Incidentally, a new award will be issued to the top competing Team at the Championships. It's called the Dan Pruss Award. Dan's widow, Patricia, wrote: "My husband had only two bequests in his will; things he truly believed in: the first was S.O.A.R., the second was F3B. I wish you all the best, and in his name I'll say: 'Winning may never change the world, but sportsmanship and friendship might make the difference.' " (signed) Patricia Pruss.

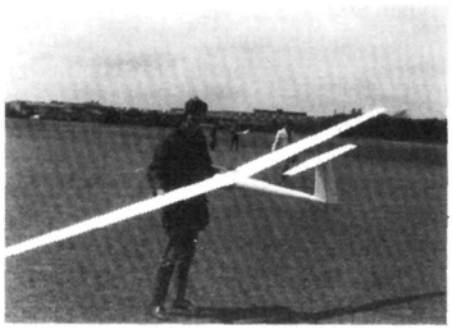
Need more be said?

Brian Cooper's 1/16-scale Hamilcar, WW II troop glider.

A Phoenix Rises

A few weeks ago I loaned my Prophet 2-meter sailplane to a friend and he was doing just fine—made a landing or two, did some nice turns and even managed to catch a thermal. As he came back from the flight and set up to land, all was going well until he got below the tree line. Suddenly he lost orientation, turned toward the trees, stalled, spun, and KEE-RASH! It all happened so quickly I didn't have time to grab the box and try to recover, if possible. Of course my friend was terribly upset and unhappy, but I calmed him down a bit by telling him that there are two kinds of pilots: those who have crashed and those who will crash. It's part of the learning experience. Yes, a "buddy box" would help, but I don't happen to have one.

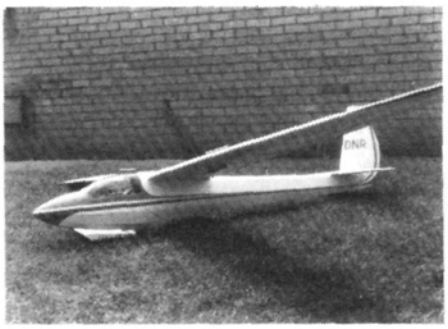
We gathered up the remaining bits and pieces and found that one servo had a set of gears with missing teeth. The fuselage looked like an eviscerated carp and obviously was not worth repairing. The rest of the radio was okay, and the wing was hardly damaged. It required a bit of new leading edge stock, a repair of some cracked ribs, and replacement of some sheeting on top and bottom. Yes, and some new Top Flite* MonoKote, too. Goldberg* Slow Jet is excellent for repairs, although a bit slow for my usual hurried approach, but it is strong!



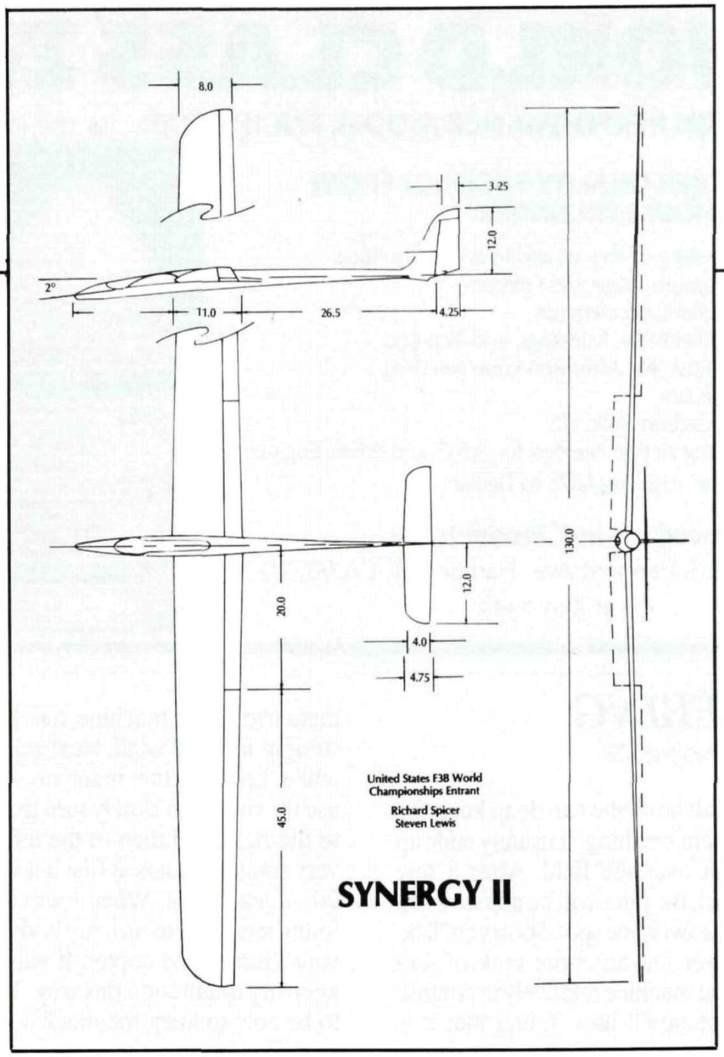
Scale Kestral by Martin Garnett was flown in open thermal competition at Radioglide '86.

The wing looks like new, but what could I do about the poor fuselage? Well, after thinking about building a new one, I decided to accept the offer of a pod-and-boom fuselage from Ty Sawyer, one of my flying buddies. The pod-and-boom was likewise the remains of a crashed sailplane; an experimental one that Ty had built. A careful examination of the fuselage and the Prophet wing showed an almost perfect match, so in a day or so I managed to mate the two of them and produce a nice-looking sailplane.

The tail section more or less sorted itself out, as I had decided to make a V-tail for esthetic and practical reasons (yep, I'm a sucker for V-tails, flying wings, and all sorts of other aeronautical exotica). Readers, you wouldn't believe how nice this new machine looks!



Norman Dean's gorgeous ¼-scale ASK 18 from Charlesworth plans. See text.



How does it fly? Better than I had hoped. It has a clean, flat glide, and excellent penetration at a wing loading of about 8.25 ounces per square foot. The climb on hi-start is superb, and there doesn't seem to be any squirrelly behavior. On the day we tested the Phoenix—a name for a bird that arose from the (CR)ashes—the weather wasn't all that great, but it flew, and flew, and flew. It begins to look like I'll have to add spoilers after all, because when there is lift, I'm sure that it won't want to come down.

For those of you who have seen the old Airtronics Grand Esprit, just visualize this Phoenix as its smaller counterpart. They look remarkably similar, and fly somewhat alike as well. Moral of the story is that things are never as bad as they look, so take heart and make that smashed-up sailplane fly again. Funny how they always seem to fly better after a crash or two; wonder why?

Scale News

For those of you involved in scale sailplane modeling, it won't come as any surprise that the hot spot of today's soaring scene is *scale*—running a close second behind cross-country, or F3H if you're into FAI designations. In a recent meet in England, over 120 entrants in Scale showed up to fly. The sailplanes ranged from ultra-modern to vintage soaring types, and from ¼-size to ⅙-size. In case you wonder why I don't say "¼-scale," the answer is simple: it's not correct! One-quarter *scale* means a scale of ¼ inch to the foot, not ¼ size. In fact, ¼ size would be 3 inches to the foot. Yeah, I know it's picky and everybody (but me) says ¼-scale, but why not be accurate?

I'd like to suggest that cross-country might be very nicely combined with scale. I'd be willing to bet that a nice ¼- or ⅓-size ASW-22 would make a pretty darned good cross-country machine.

(Continued on page 100)

SYNERGY II SPECIFICATIONS

CONSTRUCTION

General:
Airframe designed for 44G loading. All radio components installed in fuselage. Torque tubes activate ailerons and flaps. Ballast box located in fuselage has 3-pound lead capacity.

Fuselage:
Materials used in molding fuselage: E-glass, Kevlar, carbon fiber, 4-1 epoxy resin. Layers of glass cloth are added in equal increments from the tail to equal 7 layers at the nose.

Wing:
Materials and assembly: 2-pound density blue foam core. Wet layup, vacuum bagged. Unidirectional carbon fiber root to tip. Unidirectional S-glass leading to trailing edges. Unidirectional E-glass doubler tapering spanwise to 40 inches out from the root. Molded leading edge. Molded carbon fiber spar/wing joiner.

Stabilator and Rudder:
2-pound density blue foam core E-glass wet layup, vacuum bagged. Airfoil—NACA 65009

CONTROL FUNCTIONS

General:
6 surfaces, 6 channels, 6 servos, several mixers. Transmitter: 7-channel Futaba FM G-Series, modified by Mark Crane. Adjustable ratio on mixers. Adjustable percentages. Aileron and flap channels are amplified to 125% to increase servo travel and reduce linkage pressures.

Control Surface Deflection/Trim
Rudder—0% to 100%
Stabilator—0% to 100%
  flaps—% of stabilator
  ailerons—% of stabilator
Ailerons—0% to 100%
  flaps—% of ailerons
  rudder-thermal set—100%
  speed set—0 to %
Brakes
  flaps—to 90°
  ailerons—10° up
  stabilator—compensates
Launch Switch
  flaps—30°
  ailerons—10°
  stabilator—compensates

Synergy I prototype designed by Tom Strouth and Rick Spicer. Synergy II designed by Richard Spicer. Airfoil designed by Michael Selig. Construction by Team Synergy.

HOVERING

(Continued from page 79)

hover, it is all he or she can do to keep the machine from crashing. It usually ends up hopping all over the field. After a few tanks of fuel, the pilot will be able to keep the machine over one spot. Soon you"ll be able to hover out an entire tank of fuel and keep the machine relatively in control. By this time you'll have found that it is easier to hover the machine about 3 to 4 feet high, which is above ground effect.

The next exercise is to move the machine where you want it to go, instead of where it wants to go. Gently move the helicopter to the right, left, forward, and back. To gain more precise control, try to move the machine a set distance, say three or four feet, stop it and then move it in the other direction. Work up to moving the helicopter in a square pattern and then continue two movements at once and move diagonally. During all the previous maneuvers the machine has been kept straight into the wind. Next start a hover while keeping the machine stationary; use the rudder to slowly turn the machine to the right and then to the left. Move it very small amounts at first but work up to 90° to each side. When I was learning, I found it helpful to turn my body the same way I turned the copter. It was easier to keep my orientation this way. The goal is to be able to keep the machine over one spot and rotate the machine through 180°, 90° in each direction, and feel in total control.

The next thing to try is the moving hover. Lift the machine off, turn it 90° to one side, hover forward 10 feet and stop-turn the machine around 180° and hover forward 20 feet. Do this until you feel comfortable. Try to maintain the same altitude throughout the entire exercise. Always end the flight by gently setting the machine down exactly where you want it.

By now you have probably removed the training gear—and you'll never need it again. Now, on a relatively windless day, try hovering in a circle around yourself, first keeping the tail toward you and then with the machine perpendicular to you. Learn to do it in both directions. Keep the speed and altitude constant as you go around the circle. You'll have to use the rudder all the time to keep the machine on line. If you're flying where there's wind, the altitude and speed will be harder to control because the machine will tend to sink when it's going downwind, and climb upwind due to the relative increase or decrease in airflow over the rotorhead caused by the wind. This change in airspeed affects the lift of the rotor.

Now that you can hover your machine, I want to mention maintenance, the key to successful, trouble-free helicopter flying. The helicopter should be checked after each flight for blade damage and

(Continued on page 84)

HOVERING

(Continued from page 82)

loose parts. At the end of the flying day or at least every few days the machine should be carefully checked for loose parts. Check the side frames for stress cracks. Look for worn ball links. Replace any damaged or missing parts. All dust and dirt should be removed from the mechanics. This is best done with compressed air; but a soft, clean paint brush will also work well. Occasionally grease the bearings and all other moving parts except the main drive gear. This includes the tail rotor drive wire, if present, even if it must be removed from the machine to do it. On machines that have a plastic tail rotor pitchplate without any ball bearings, oil it after each flight.

And that's it for this month. Next time we'll cover tailrotor compensator, pitch/power curve adjustment and how to start forward flight. ■

GOLDEN AGE

(Continued from page 15)

walked into the small shop and saw little activity. I soon found out that the first production model had yet to be built, but if I cared to wait they would build it. I decided to wait. The next two days and nights were almost unbelievable, but by personally assembling the stick box I did finally see a complete system. I made a bench check and the system was mine. It operated flawlessly for hundreds of flights, including the first FAI World Championship in Switzerland.

R/C is widely used beyond modeling today and Bramco did its share of making the general industry aware of it. Bramco's wide diversification also led them from our hobby, which was our loss. Also due to the company's expansion, when Bramco lost the GE business they were in financial trouble. While they were messing with TV controls, the rest of the R/C industry was progressing rapidly, leaving the Bramco designs far behind. The outcome was the sale of the company to a large electronics firm with no interest in R/C. Branstner left the company and joined a subsidiary of Chrysler, which produced drag racing cars. His modeling background showed up when he lightened the car, substituting aluminum for the normal steel where possible. The National Champion "Color Me Gone" dragster was the result.

Dick finally settled down in the corporate field as a project engineer for a major hobby/toy company.

The Bramco company, however, was probably an inspiration to the whole Detroit R/C area. The Detroit R/C Club was a leader of that day, instigating the R/C conference which would become the Toledo Show, as an example. Another milestone was the Detroit Invitational R/C Meet, which the top competitors of the day were invited to attend. The prizes were fantastic. A very professional and successful affair, it was a distinct honor to be invited; individual fliers from the entire country flew each year. I'd like to discuss the meet in this series, but I need photos. Anyone have any good black-and-white glossies of this event?

The Detroit group produced a couple of R/C designs which would fit today's scene very well. One was Ernie Kratzet's Eskimo, which was very similar to Bill Northrup's Big John biplane. The Eskimo was giant-scale, with about a 6-foot span and .60 power. Ernie campaigned his version for several years, always drawing attention with its realistic flight. Others had their versions with Branstner's checker-board aerobatic color scheme greatly admired. Again I have no photos, can anyone help?

Another local craft might be a club design as it was very successful with many examples flown in the area. The actual designer is unknown, but Tom McCoy was certainly an instigator and I thank him for the photos and information.

The Live Wire Champion was a very popular kit design of that period, but it was a bit small for the new heavier reed systems. Apparently the basic design was

(Continued on page 86)

GOLDEN AGE

(Continued from page 84)

attractive to the Detroit R/Cers, so they enlarged it 30% with slight modifications. They also had considerable success with Schneider Cubs, so the enlargement put the Champ into that size range. The sleeker Champ simply added to the Cub-style performance.

In thinking of an OT design to use today, McCoy's opinion has been that the big Champ would make one of the best, while being a model that not everyone would be copying. Slight changes in the design included a symmetrical airfoil and a reduction in wing incidence to suit that airfoil. Tom's original was powered with a Bramco-throttle-equipped Fox .35, a popular R/C engine of the day. Control was with a Bramco Regent 5-channel and dmeco servos provided rudder, elevator, and engine controls. It is amazing how much good flying was had with so much less power than is used today. Perhaps it relates to propeller choice? That little Fox probably turned a 13x5!

A letter from Bob Barber of Rio Rancho, New Mexico, tells of an experience relating many an OT modeler's saga: his father introduced him to modeling with a rubber-powered kit in 1927, just as Lindy did his thing and got everyone excited about aviation. Bob grew into a free flight enthusiast and later joined the Air Force where he flew B-24s in WW II, then B-29s in Korea. He has continued free flighting through it all. Anyway, Bob relates a recent story:

Stuart Ravenbyrne was an avid R/Cer in the early '50s and lived on a farm in Albuquerque. Unfortunately, he suddenly passed away. His workshop was in his barn and his modeling remained there, as he had left it. Bob Barber recently stumbled into that barn and was astounded by the wealth of the early R/C gear. The clean, dry New Mexico climate preserved the equipment for over 30 years in like-new condition! Stuart had several planes and radios, and over 20 engines, plus the usual accessories to go with them. One of the ancient K&B Torpedoes started quickly and ran like new, original glowplug and all.

Bob Barber's current project is to recover one of Stuart's Live Wire Rebels and get this OT flying with the original C-G radio, but he needs the radio's instructions. The transmitter is a C-G model I on 27.255 MHz. The receiver is a C-G model RT-I. The radio was manufactured by C-G Electronics of Albuquerque. Can anyone help?

I'm rapidly approaching the end of the "reed era" with the history portion of this series. I know I haven't covered all aspects as thoroughly as should be done, but I could use some help. Does anyone have information and photos concerning Phil Kraft, Bob Dunham, Frank Hoover, Min-X, Logictrol, Quadraplex, Sampey, and others? I know these inspired people and companies created a wealth of good things which would be interesting to know about.

I continue to get letters about building and flying OT R/C today, also relating to an organization to promote OT R/C. Do you have any input on that score?

Hal "Pappy" deBolt, 632 Danbury Rd., Wilton, CT 06897. ■

HELICOPTER

(Continued from page 35)

ments, as this will allow you to make trim adjustments in either direction if necessary at the field.

Next, you'll move the throttle stick to the full high position and set the high end by using the pitch curve high adjustment. Check for all of the pitch angles by using a precision pitch gauge, and be sure to read the instructions included to insure accurate results. Finally, move the throttle stick to the low position and set the low pitch angle with the pitch curve low adjustment. I have recommended that the low pitch be set using the angle of ½°.

When you're setting the pitch curve up on your machine, it isn't necessary to check both blades. I check both blades anyway, as often they will be nearly perfectly in track on the first run-up. If you elect to set only one rotor blade for now, be sure to mark the blade, and don't change the setting of this blade during the tracking checks.

Final Assembly and Pre Run Checks

To install the body, mount the switch harnesses, add the fuel tubing, and inspect for airworthiness. Take this opportunity to check over the entire helicopter for any minor detail that has been overlooked. If you're not sure how something is intended to function, be sure to check the instruction manual or get help.

I like to mount the switch harnesses somewhere on the mechanics so that the body may be removed without having to disconnect any of the wiring. This usually requires a plate of some type be made so that it may accept the switches and bolt to the mechanics. I use thin aluminum sheet for this job, as it is easy to cut. If you are handy with metal work, and have the necessary tools, you may want to use a slightly harder piece of aluminum like one of the aircraft grades. This will allow the part to stand up to more abuse than the hobby store variety of aluminum can endure.

Follow the instructions for mounting the body and be sure that it lines up properly and that none of the linkages rub or bind on the body. Make sure that the receiver antenna will exit directly out of the body, and that the antenna is not wrapped around any framework inside the cabin area, or coiled around itself.

You're ready to fly! If you're a beginner, you'll need some form of training gear to prevent the helicopter from tipping over during your early flight sessions. The training gear can be constructed from a variety of materials, but the most popular is the wooden dowels with whiffle balls attached to the ends. This arrangement should consist of two dowels of at least ⅜ inch diameter, and 36 inches long with a ball glued to each end. If you want to get fancy, you can cut some automotive fuel hose of ⅜ inch i.d. into washer-like widths of about ¼ inch, and glue them on either side of the ball with instant glue. This will allow the balls to roll, which can be helpful if you're going to fly off of pavement.

This entire assembly gets attached to the landing gear of the helicopter with rubber bands or cable ties. Place the dowels across the landing gear diagonally so that one dowel will cross through the front landing gear strut on one side, and then through the rear strut on the other side. Another excellent form of training gear are the floats intended for flying the helicopter off of water. If you use floats, inflate them about half as much as normal so that the floats provide more shock absorption. I have seen floats take a lot of abuse, and leave the machine virtually undamaged from situations that appeared to be certain disaster.

Well, that will conclude our series on helicopter construction. Hopefully all of you have been able to get something out of this. It would be nice to hear from you if you have any comments.

Next month I'll go into the first flight, and begin a series on flight training with tips on progressing faster, along with trimming help. So for now, keep the spinning side up!

Pro Tip of the Month

Tired of having to juggle your workbench and move your helicopter about in awkward positions just to get your pitch curve set-up? Stop fighting with your helicopter. The next time you break a set of rotor blades at the tip, save them and cut off all but about 12 inches from the root. Bolt these up on the rotor head, and all of the pitch adjustment jobs become much simpler!

Craig Hath, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

The Great R/C Design Contest

Sponsored by Model Airplane News, Hobby Shack, Airtronics, Midwest Products, Top Flite, and United Models.

Now is your chance to become a famous modeler!

The top five designs will be featured in **Model Airplane News** magazine as feature construction articles. All entries, however, will be considered for future construction articles, so get designing and building right now!

1st Place—$2,000 cash

2nd Place—$1,000 cash plus Hobby Shack EZ Laser, Airtronics, CS7P radio, and Saito .90 engine.

3rd Place—$500 cash plus Midwest Super Hots kit, O.S. .60 engine, and Airtronics radio.

4th Place—$400 cash plus Top Flite P-47 kit, Enya .60 engine, and Hobby Shack radio.

5th Place—$300 cash plus Midwest Hots kit, and O.S. .40 engine.

How to enter:

Simply submit a clear photograph of your model no later than June 1, 1987. Any type of model R/C airplane qualifies. Previously published or manufactured designs are not eligible.

Who decides the winner?

You do! The top designs will be determined by your vote. The September 1987 issue of **Model Airplane News** will have photographs of the models listed by number. Just send us a postcard with your favorite design listed and we'll take it from there.

Announcement of winners:

The December 1987 issue of **Model Airplane News** will feature a full spread of all the winners as well as a feature construction article of the 1st-place winner.

Be prepared:

Winners must be prepared to submit a complete construction article (6 to 8 typed, double-spaced pages), plus black and white photographs of the building sequence, full-size construction plans, and color slides of the model in static and flight conditions. Prior to the announcement of the winner, the publisher must receive verification that plans, photos, and manuscripts of the top five designs are available.

Product News

SUPER GEMINI

The O.S. FT-240 Super Gemini from Great Planes Model Distributors (P.O. Box 4021, Champaign, IL 61820) is a four-cycle twin engine that gives tremendous power and has a sensational appearance. The Super Gemini features a ball-bearing-supported crankshaft, ringed piston, and an excellent power-to-weight ratio. Despite its high power output, the FT-240 is smooth-running, produces very low levels of vibration, and has a realistic sound that is pleasing to the ear. At a weight of 66.3 ounces, this engine has an rpm range of 1,800 to 8,000 and can swing a 20x10 prop. The O.S. FT-240 Super Gemini will give any giant-scale aircraft the power, performance, and great looks that it deserves.

PROCTOR'S JENNY

Everything you've come to expect from a Proctor kit is here. From the beautiful hand-selected hardwoods, balsa, and veneers to the machined fittings and operating turnbuckles, this kit is guaranteed to please the most discriminating modeler. While not recommended for the beginner, the Jenny isn't a hard model to build. The kit can be built to basic specs by the average modeler. The serious scale builder can choose to fully detail the cockpit and even construct the opening turtleback. All the required info can be found on the plans, from Proctor Enterprises (25450 N.E. Eilers Rd., Aurora, OR 97002).

AERO-TECH 2

Aero-Tech 2 from Hilton Hy-Per-Lube, Inc. (12515 130th Lane N.E., Kirkland, WA 98034) is a special blend of premium-quality lubricants formulated specifically for use in ultra-light, radio-control and small experimental two-cycle gas engines, especially those operated at high speeds and under severe high-load, high-temperature conditions. This unique aircraft-quality lubricant has a high film strength ability to combat piston scuffing, engine wear, and the build-up of carbon deposits that contribute to plug fouling, overheating, and pre-ignition. Special compounding with the highest quality additives and octane boosters assures rapid and complete mixing that allows fuel to burn clean, cool, and smokeless.

MICRO-DROPPER TIPS

These tips fit all the sizes of bottles offered by Penn International Chemicals (943 Stierlin Rd., Mt. View, CA 94043) in the PIC-STIC cyanoacrylate adhesive line. The tips are claimed to be the "single most important advance" in precise and easy control of small bead and accurate drop dispensing of these adhesives. The tips are made by hand and are offered in two sizes, fine and extra-fine. The fine is best suited for use with medium-viscosity adhesives (Best Choice, Plasti-Stic), and the extra-fine for the very thin penetrant type or plastics grade for precise dropper action.

FUTABA ENGINES

The National Pattern-winning YS/Futaba (555 West Victoria St., Compton, CA 90220) 60F model aircraft engine is virtually hand-built, featuring superior material and CNC machining quality, ABC design and YS/Futaba's unique, variable pressurization system. Designed for maximum power output, the YS/Futaba 60. features superior material and machining quality, ABC design and YS/Futaba's unique, variable-pressurization system. Other features include adjustable pressure regulator, integrated carburetor design, special YS butterfly-type throttle and convenient needle valve adjusting.

U-KNEAD-IT PUTTY

From Penn International Chemicals (943 Stierlin Rd., Mt. View, CA 94043) comes a masking putty/fixturing agent that allows complete camouflage color schemes to be totally generated with spray-can paint. The putty is placed in position over initial paint coats, shaped with the fingers to the desired configuration, and directly painted over. The beauty of the system is that the putty is removed, re-kneaded, and reusable again and again. No residues or chemicals contaminate the protected color areas. The UKI is also claimed to be a time saver as a temporary fixturing agent to hold parts for gluing or painting—can be used to captivate loose servo wires.

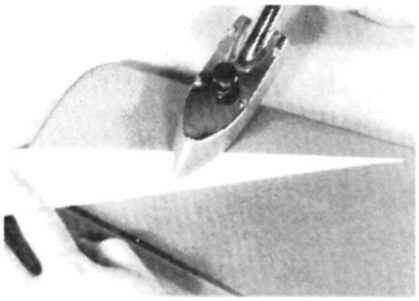
Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News,** or guarantee of performance by **Model Airplane News.** When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News.**

SEAWIND

The full-scale Seawind is a home-built amphibian kit designed by Lena and Roger Creelman of Haliburton, Ontario. The Byron Originals (P.O. Box 279, Ida Grove, IA 51445) ¼-scale Seawind, like its full-scale counterpart, offers an extremely stable platform with light elevator response and stable flight characteristics. Its wing tip design rolls down in STOL fashion, providing additional airlift while serving as an effective wing tip float. Byron Originals adds scale options for realism—retractable rudder, custom retractable mains and nose gear, sequencing doors and operational flaps, which come to you prefabricated.

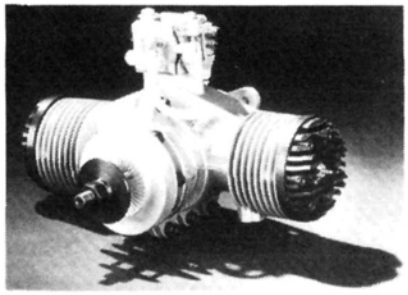
R/C COPTER VIDEO

Learn to hover and watch the experts fly—all in one great video shot in California featuring the blue Pacific and California beaches. Sit back, relax, and watch this 23-minute cassette tape of GMP's R/C helicopters flown by beginners and experts over land and sea. Professionally shot and narrated, it brings to life the flying maneuvers that an R/C modeler wants to see. It not only introduces you to the amazing aerobatics of GMP's fine line of helicopters, but it also includes a section that guides the novice step by step in learning how to hover. From Gorham Model Products (23961 Craftsman Rd., Calabasas, CA 91302).



ULTRACOTE

Ultracote from Carl Goldberg Models, Inc. (4734 West Chicago Ave., Chicago, IL 60651) is a polyester film that has a high-tech polymerized film-to-color bond, and a broad temperature tolerance, permitting the user to coax it around compound curves and then reposition it without fear of layer separation. Once it's in place, it's there to stay. Some plastic films don't bubble, and some don't sag. Ultracote is the first plastic covering film to give the user both bubble-free and sag-free results. Since Ultracote is a polyester film, it responds well to higher temperatures and really takes a permanent set.



TWIN STAR

Introduced at the IMS in January, the Twin Star is the newest entry to the 2-cycle Twin Market from Jay-En R/C Supply (474 Kalanikoa St., Suite 204, Hilo, HI 96720). This 40cc opposed twin features a net weight of 2.7 pounds without prop and muffler, excellent power-to-weight ratio, double ball bearings and best of all, low cost. Opposed simultaneous firing cylinders swing a 18x8 prop at 7, 100 rpm. Pumper-type Walbro carb and hot R/C plugs make for smooth power transmission. This engine is manufactured in the People's Republic of China to fit the requirements of the larger scale modeler.

AERO-STAR

When you choose the Midwest Products (400 S. Indiana St., P.O. Box 564, Hobart, IN 46342) Aero-Star, you'll find out just how easy it is to get started in R/C! The Aero-Star .20(tm) is an R/C basic trainer that has been designed and engineered to offer the greatest possible assistance to someone who is both new to the hobby of building models and the sport of flying them. You won't have to struggle with dozens of tiny wood parts. Almost all of the Aero-Star's parts are pre-cut. The fuselage is built from 11 die-cut, Micro-Lite plywood parts that self-align with fast-lock tabs. The Aero-Star wing is for either 3- or 4-channel radio control. Pre-shaped parts for both versions are included.

J'TEC SMOKER

J'TEC (164 School St., Daly City, CA 94014) now has a Smoker kit available for their new .60-5.1 mufflers. The smoker system is easy to install and produces clouds of smoke on command. This system works off of crankcase pressure which forces the smoke fuel through the preheater coil. The included smoke fuel shut-off valve is simple and cannot leak. It shuts off or turns on the pressure from the crankcase and to the muffler at the same time with no load on the servo. A formed copper coil, inserted into the muffler, preheats and instantly vaporizes the smoke fuel. A one-way check valve prevents smoke from being forced back into the crankcase. The BUNA-N tubing is specially compounded for smoke fuels.

FROM COCKPIT

(Continued from page 23)

forward, the normally fixed portion at the back also hinged forward, giving the rear-facing passenger an unobstructed view of whatever was behind him. This view was necessary because a single Browning was mounted in a swivel fitting for air-to-air gunnery practice. It's not known whether the guns were equipped with interrupters to protect the tails or not, but something had to be done to keep a student from turning his own tail into lace.

A detail freak would have to put his T-6 into its actual color scheme, which was a variety of paint colors completely covered by a thin layer of boot marks. But most of the boot marks were on one side of the airplane! Pilots even in those days wore flight boots which weren't particularly gentle to aluminum wing walks and fuselage side panels. Since the student and instructor had to clamber over the sides of the fuselage (airplanes are mounted from the left), the left side of the fuselage and the wing walks took a beating. And that's what the model should reflect.

The inside of the fuselage and cockpit area should be a dull chromate green and all consoles and the instrument panel should be flat black and very shop-worn; the aluminum underneath should be working its way through the flat black paint. This is especially true of the flap and trim console on the left and the radio rack on the right. This wear was caused by the seat belts. They were 3 inches wide and had heavy over-center latches that weighed about a pound apiece. When the pilots unlatched and got out of their straps, the buckle/latches were thrown to the side and they eventually ate a lot of the black paint off the consoles. Now there's a neat bit of trivia for the judges.

Since 90% of the T-6/SNJ/Harvard Scale models built today carry a training command paint job, why not look for something different? For one thing, practically every fighter and bomber squadron had a couple of "sixes" for "personnel hacks" to be used in running people around the countryside. In many cases these were painted in the exact colors of the fighters/bombers of that particular outfit. Many of these schemes are hard to document, but information is out there and if you keep your eyes on the backgrounds of wartime photos, that's where you'll find it.

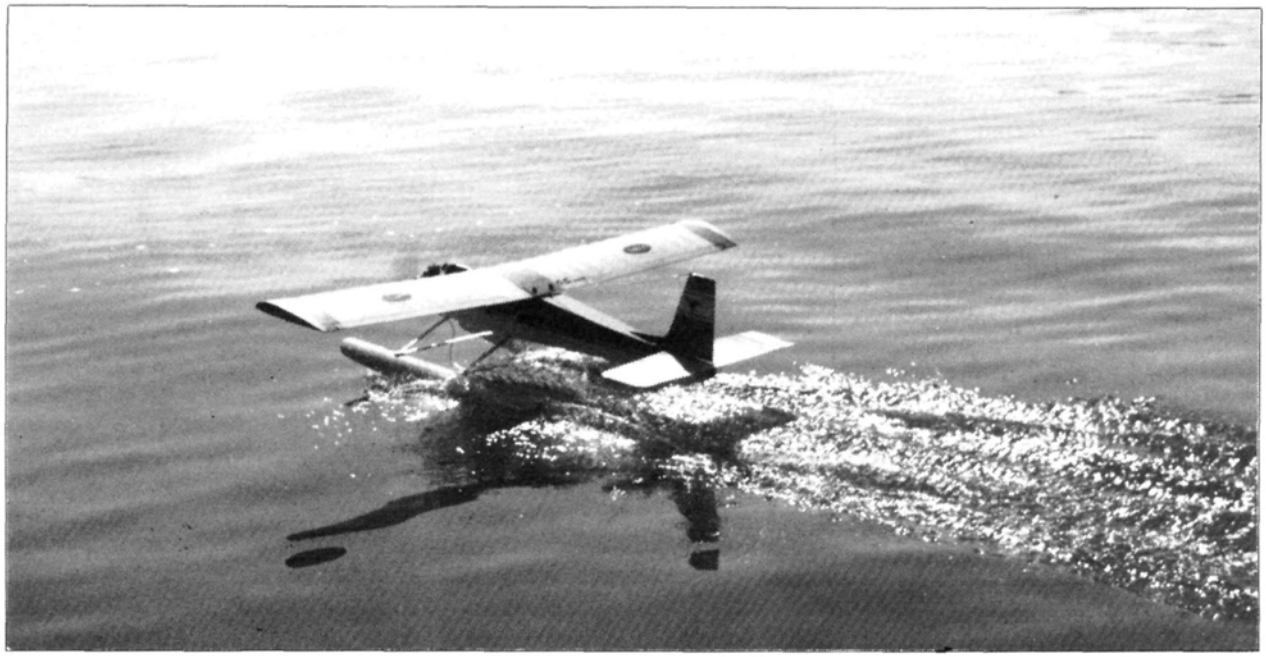
Another neat approach would be to set up a Texan as a Korean War LT-6G. These were forward air control aircraft which were sent out ahead of the fighters and bombers to mark the targets with white phosphorous smoke rockets. They'd cruise along at 4,000 to 5,000 feet at 170 mph and pump rockets into the target, which would usually shoot back. Because of the conditions under which they flew and the beating they took, it wasn't long before the LTs looked like they'd been ridden hard and put away wet—which was the case. A model of an LT could have it fitted with two rocket rails, and six rockets under each wing and a lot of grime everywhere. A few bullet holes would also be authentic.

Of course, the biggest reason there is no excuse for not detailing a Texan model accurately is that there are so many of them around. It's practically impossible to go to a fly-in and not have at least one of the round-motored monsters as part of the gathering. Most Texan owners are willing to let you climb up on the wing with a camera and shoot pictures until you're out of film. The trick is to show them you're interested and have tremendous respect for their airplane. Don't get demanding and, above all, don't touch the

(Continued on page 98)

Floating Around

by JOHN SULLIVAN



Emily Kremper's Fox .40-powered Eagle 63 taxies out for her first flight over Clear Lake. Note nose-high attitude of floats.

IT GOES WITHOUT SAYING that the choice of a trainer and its components is the most important decision a beginning modeler can make. I have some reservations about recommending a floatplane for the first-time flier, but there are also benefits, so I'd like to discuss the pros and cons and let you decide.

In the first place, the novice would already appear to have enough to contend with, without adding floats to the mix. He's just spent a sizable amount of time and money on his first plane, along with a considerable emotional investment. His knees are shaking and his heart is pounding. There's the element of engine noise, which is disturbing until you adjust to it, and all your fears come to the fore. Did I use enough glue? Is the vibration shaking the transistors out of the receiver case? Will the covering tear off the framework once I break ground? All of the above and more can give you the sense of well-being one experiences, for example, when your ultralight engine dies while flying over a burning oil refinery.

Without getting into the float issue just yet, there *is* an answer to the above, and that is to buy a "real" trainer, and forget your pride for a moment and seek the help of someone who's done it all before. There are no figures available, but I would guess that there are enough smashed first planes around to fill the Khyber Pass, and that's a shame because this is a beautiful hobby with the potential of providing a lifetime of unbelievable enjoyment.

The choice of a perfect trainer, I feel, is not difficult if you accept the following parameters: 1) Pick a trainer in the .20 to .40 size engine range. Engines less than a .20 size can be temperamental at times, and those .60 and larger can hurt you badly if you are not comfortable with them. 2) Pick a trainer from a well established manufacturer that features an easy-to-build model with a light wing loading. The airfoil should be flat-bottomed (no exceptions) with dihedral sufficient enough for hands-off recovery. Also, be sure the planform features long moments and the plane has three controls (rudder, elevator, and throttle) with perhaps the potential of adding ailerons later. 3) Don't buy a plane that's supposed to be "ready for more when you are." I know there are a few pilots out there who did just fine with their Kaos as a first plane, but there are a lot more who didn't. This is a fun hobby; however, the laws of physics apply here with a brutal exactitude, and that which stalls at anything subsonic will always stall at that speed, even if you hope it won't.

Now for the part about seeking qualified help. The plan is, of course, to find someone who can check your plane out, fly it for you, and then proceed to let you have the transmitter for a few precious moments while standing by to help when you need it. There are a lot of qualified people who can do just that, and they are easy to find by checking with hobby shops and visiting flying sites. But since I'm talking to beginners I have to tell you that learning is a two-way street, and you will have to exhibit attention to detail and uncommon cooperativeness with your instructor to make this partnership work.

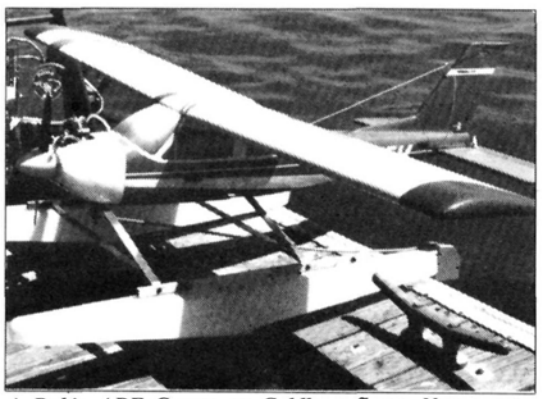
I just read a letter from an instructor who after several years in that capacity

George "Field Marshal" Graff and his Goldberg Falcon on floats. It's a good intermediate or aileron trainer.

Bill Bisel and Blaine Russel with fine examples of the J-3 Cub.

Gary Gleffe preps his Telemaster 66 on Gresham floats. Uses Super-Tigre 29 power and has proven a fine trainer.

Emily Kremper pilots her airplane while son Mike watches attentively.



A Rubin ARF Cessna on Goldberg floats. Note water rudder hookup to existing nosewheel tiller.

had vowed he would never again attempt to train someone unless he could see that the guy *loved* airplanes. It's one thing to build a plane, gas it up, and send it off to see if it works. Buts it's a far better approach to read about aircraft and understand why they fly. Why does an airfoil produce lift? What does the rudder do that's different from the ailerons? Why is the CG important, and what characteristics will a plane exhibit, for example, if it's tail heavy? Fortunately, these are not difficult questions and the answers are available through the hobby's excellent magazines and publications. It all boils down to your ability to relate to your instructor, and you'll find that a good understanding of what you're about to do will be a tremendous help to both of you.

So now we've come full circle. Your plane is finished, you understand the basics, you've got an instructor lined up and there's this pair of floats sitting on your workbench, ready to attach to your trainer. What to do? I'd go for it, for the following reasons. Number one, even if your instructor has never flown a float-plane, it's safe to assume that he got to *his* level of proficiency by flying at least intermediate type planes, and he will quickly discover that your trainer on floats is as easy to take off and land as the best trike gear setups. So now you have an instructor who has become adept at float-flying after one flight, and the second reason, actually an advantage peculiar to float-flying, comes into play. If you fly from one of the thousands of lakes, ponds, wide rivers, marshes, etc., that dot this

(Continued on page 108)

FROM COCKPIT

(Continued from page 95)

airplane until you have permission. Touching without permission is an excellent way to risk amputation.

With over 700 Texans still flying, you're out of excuses. Go pick up a kit, your camera, and have at it. ■

4-STROKE OPER.

(Continued from page 32)

tion and the generation of still more heat to make matters worse.

It used to be thought that the best way of dealing with this problem was to first "motor" the engine by coupling it to an external power source. Certainly, this used to be helpful in easing the very tightly fitted babbitt-metal bearings used in the early days of automotive and aeronautical engineering but, with model motors, such preliminary procedures serve no useful purpose and have no effect on the length of the full break-in time. This is because, in a model engine, the most critical parts are the piston and cylinder and it is necessary for these to be subjected to normal working pressures and temperatures, for brief periods, to enable running-in to take place properly.

One cannot be dogmatic about what goes on inside an engine when it is running. It is impossible to see or measure all the changes that different parts undergo while the engine is operating at, perhaps, a hundred cycles per second for a model four-stroke engine and upwards of double that number in the case of model two-stroke engines.

Certain processes are, however, self-evident. We know that, although the surfaces of newly manufactured working parts may appear to be beautifully smooth to the naked eye, they are actually a succession of hills and dales when examined under a microscope and that, as they rub against each other, the high spots are worn down and "fit" is thereby improved. We must also understand that different components, and even different areas of those components, distort in varying degree, according to the thermal and mechanical stresses imposed upon them and that these movements, minute as they may be, must also be accommodated by additional "wearing-in" at those points where clearances would otherwise be reduced to below the safe minimum when the engine is hot.

To help the engine through this critical period in its life, one thing stands out as all-important: heat must not be allowed to build up excessively. Too much heat means excessive expansion, a reduction in clearances, more friction and, thus, more heat, thereby entering into a spiral in which clearances are eventually reduced to the point where friction overcomes the power available and, if lubrication then breaks down, the engine is brought to a grinding halt.

We can prevent this excessive heat build-up during breaking-in in three ways:

1. Use a fuel which contains an adequate proportion of (preferably) castor-oil and a minimum of power-boosting additive (nitromethane). A straight mixture of four parts methanol and one part castor-oil will suit most four-stroke motors for breaking-in.
2. Open the needle-valve so that the fuel/air mixture strength becomes over-rich. This will cause less of the fuel to be burnt and the remainder to pass through the engine, acting as a coolant.
3. Run the engine for short periods of time, especially at the beginning of the break-in process, with a cooling off period between each run.
4. Do not overload the engine with a big prop. Choose one of the medium sizes recommended in the instructions.

Model engines, in general, vary a good deal in regard to breaking-in requirements and, happily, four-strokes are rather less critical to break-in than two-strokes. There is no doubt, however, that all engines benefit during breaking-in from being brought up to normal operating temperatures for brief periods and

then allowed to cool off. This is borne out by the experience of many years of testing hundreds of new engines, each of which has had to be properly broken-in before it could be subjected to the rigors of testing for power output. It is of little or no use, for example, to run an engine at a reduced throttle setting or at a rich setting for hours on end, in the expectation that this gentle treatment will have the desired effect. It will not.

The reason for this is that the components have, in effect, to become "acclimatized" to the environment in which they will eventually be called upon to operate. The minor distortions that engine parts suffer are, themselves, subject to certain changes and it appears that stability is only achieved after the parts have progressed through several cycles of heating and cooling and the necessary permanent clearances achieved.

About one hour of total break-in time is usually sufficient to bring the average engine up to the point where it can be safely run at full power continuously. This generally holds true for engines having .60-.90 size cylinders. Bigger engines may need rather more time whereas, with smaller ones, 30-40 minutes running time may be sufficient.

The throttle should be kept wide open during the break-in (although it may be slightly closed for the first few runs if the new owner prefers) using the rich setting of the needle-valve to reduce rpm.

The rule is to start the break-in with the engine running very rich and to close the needle-valve gradually with each successive tankful of fuel. By the time the end of the nominal break-in period is reached, the engine should be operating at, or near to, its optimum needle setting, i.e. slightly on the rich side of the setting at which maximum rpm are achieved. If the engine will not hold a steady speed at this stage, it is not fully run-in and should be operated at a richer setting for a few more runs.

In-flight Break-in

The advantage of a bench break-in is that the operator has complete control over the engine at this critical stage. If the engine begins to overheat and slow down, he is on hand to take corrective action instantly: i.e. to quickly reopen the needle-valve or to snap the throttle shut if the engine shows any sign of overheating and tightening up or if, as is common with some four-strokes, it begins to detonate.

This said, it is still possible to carry out the break-in (or, at least, all but the initial part of it) in flight. There is, in fact, much to be said for bearing in mind basic in-flight break-in procedures during the first few flights of the engine, even if it has already been broken-in prior to installation in a model.

The idea here is to use the throttle control at regular intervals, combining it with maneuvers, so that the engine is alternately put under load, then allowed to cool off on a reduced throttle setting in a shallow dive. A Cuban-8 maneuver is often recommended as a good one for alternately loading and unloading an engine in this way.

If the engine has had little or no bench running prior to being flown, the needle-valve should be set as rich as is practicable without endangering the aircraft through lack of power. It is not advisable to attempt Cuban-8s at this early stage. It will be sufficient simply to throttle back at intervals for a shallow cooling off dive.

Mounting

Generally speaking, it is more convenient to learn to handle an engine while it is fitted to a bench mount than in a model. This is particularly so in the case of newcomers to the hobby and when dealing with a new engine needing to be broken-in.

Factory-made adjustable engine mounts for clamping or bolting to a suitable bench are available, or the user can devise his own mounting to which the engine can be bolted. In either case, it is essential that the mount should be strongly made and accurately aligned, so that it holds the engine solidly and without distorting it. Especially with the larger engines, vibration can quickly loosen any fastening that is not secure and if the engine's beam mounting lugs do not sit squarely on the mount, this can lead to crankcase distortion and damage or loss of performance.

If the engine is bolted to a wooden mount (always use hardwood and steel bolts and nuts—never woodscrews) some method of locking the nuts is advisable, e.g. nylon insert type nuts or extra locking-nuts, preferably with serrated lock washers. The same applies when the engine is fitted in a model.

Couple a suitable wire pushrod to the throttle lever so that it can be conveniently and safely operated from *behind* the engine. Pushrod movement should be suitably snubbed to enable the throttle to be set in any position from fully closed to wide open. A short sleeve of silicone fuel tube slipped over the wire and fixed to the rear of the engine mount or bench, slightly squeezing the pushrod, will serve here.

Fuel Supply

A conventional model fuel tank of molded polyethylene should be located behind the engine in such a position that its upper fuel level is slightly below the carburetor fuel jet. There is no need to pressurize the fuel tank. If the manufac-

(Continued on page 100)

4-STROKE OPER.

(Continued from page 99)

turer advises pressurizing the tank for certain applications when the engine is intalled in a model, pressure should be tapped from the exhaust system (or any other recommended source), *not* from the crankcase. Most four-stroke engines are fitted with a crankcase nipple, but it must be emphasized that, unlike the crankcase nipples fitted to some two-strokes, this is *not* for the purpose of pressurizing the fuel tank. It is there simply as a breather and to enable excess oil, that would otherwise collect in the crankcase, to be drained away.

Power Supply

The majority of glowplugs are intended for operation on a nominal 1.5 volts and this can be supplied by a heavy-duty dry cell, but a more practical power source is a rechargeable battery. There is nothing more irritating than to find that one has a flat battery and, although a rechargeable battery is more expensive to buy, it will outlast numerous dry cells and, if kept charged between flying sessions, will ensure that there is always a healthy starting glow at the plug.

Two types of rechargeable glowplug battery are in common use: 1.25 volt nickel-cadmium cell and 2 volt lead-acid cell. The former should have a minimum rating of 1.2 ampere-hour per plug and should be used with short, low-resistance plug leads to avoid voltage drop.

The 2-volt cells which, nowadays, are of the sealed type, are available for glowplug use in various capacities up to 10 Ah. They should be equipped with long leads in order that the voltage reaching the plug is suitably reduced. The actual lead length required will, of course, depend on the resistance of the wire. A typical example would be about six feet of 0.75 mm^2 twin lead, but exact requirements can easily be determined by trial and error. Alternatively, a short length of nickel-chromium resistance wire can be interposed between one of the battery terminals and the plug lead. If an alligator clip is fitted to the latter, the current reaching the plug element can be adjusted to give the required "glow" at the plug, according to the type of plug in use and the state of charge of the battery.

An excellent commercial example of a self-contained power source, adjustable for all types of glowplugs, is the "Fire-Plug" unit which was introduced several years ago by the Fusite Division of the Emerson Electric Company. It consists of a rechargeable 2 volt 5 Ah sealed cell, rheostat and ammeter within a high-impact polypropylene case.

Electric Starters

The traditional method of starting a model aircraft engine (except in the case of controlline speed engines which, because of the inadequate inertia provided by their tiny propellers, have invariably required some form of powered starter) is by flipping the prop. From about 1970, however, hand-held electric starters began to come into use for radio-controlled models and are now widely used.

There is much to be said for using an electric starter. There are some engines which are easy to start by hand and others which are rather less cooperative, but all respond at least as well and usually more quickly, to the application of a starter. It should be added that this generally applies to engines having individual cylinder displacements not exceeding 1.2 cu in. Most commercially available starters are not designed to cope with very large engines. Fortunately, the majority of these big engines, aided by the inertia of large diameter propellers, are not difficult to start by hand. Incidentally, "hand" starting should not be taken too literally here: for safety, a "chicken-stick" or heavy glove or gauntlet (*not* bare fingers) should be used to swing the prop.

Peter Chinn, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

For more information on four-strokes, check out Peter Chinn's Model Four-Stroke Engines, *which covers the history, design, development, and operation of these popular engines. The book is available from* Model Airplane News *for $13.95 plus $1.50 postage and handling. See the* M.A.N. *book ad in this issue for ordering information.*

SOARING NEWS

(Continued from page 81)

Going back a few years to a vintage sailplane, you might find that one of the German Weihe sailplanes would be a fine cross-country bird as well as a beauty to look at in *scale*.

Perhaps some of the earlier resistance to scale soaring and sailplanes had to do with the fact that most modelers felt that the scale birds just don't (or didn't) fly as well as the out-and-out thermal soarers, and that the scale airfoils just don't work as well as the modern soaring 'foils. Yeah? Try telling that to the venerable Clark Y! Besides, you don't *have* to use a scale airfoil on your scale glider, but you can—with good results. Some of the old Gottingen airfoils, as well as some of the Epplers and Wortmanns, are great performers in scale and full-size sailplanes.

The opportunity to simulate some of the old see-through translucent fabric coverings in a scale model of a vintage sailplane is very hard to resist. Polyester

Club of the Month

The R/C World Flyers of Orlando, Florida, are the *Model Airplane News* "Club of the Month" for July 1987. This club—situated at R/C World, the famed condo area for R/C fliers—carries on numerous activities over a given year. The year 1986 saw their Fall Festival with over 100 registrants and 150 airplanes, including visitors from Krankfurt, Germany. At the festival over 10,000 spectators were present and TV coverage was found on all three major TV stations in Orlando.

Also held in 1986 was a sailplane meet sponsored by Walt Good's soaring group, an IMAA Giant Scale meet, and the Tangerine International as sponsored by the Radio Control Association of Central Florida.

The flying site is one of the finest in America and has to be seen to understand what a model airplane facility can be. Even so noise problems hold potential for difficulty. For 1987, a dB level of 98 at 3 meters will be enforced.

This is a most unique club with its affiliation with the condominium development at R/C World. It is a club that should be considered by those contemplating a home in the area. Contact the club president Ed Izzo (296 Huntridge Way, Winter Springs, FL 32708) for info on joining.

Model Airplane News applauds the R/C World Flyers and is pleased to award two free one-year subscriptions to be given by them to juniors they consider worthy.

Each month Model Airplane News will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). Model Airplane News will award two free one-year subscriptions to be given by them to juniors they consider outstanding. So send your newsletter to Model Airplane News, Club of the Month Contest, 632 Danbury Rd., Wilton, CT 06897.

coat lining material is inexpensive and, when doped, looks just like the old-time doped fabric. Besides, it's fun to look up and see the underlying wing structure silhouetted against the sky.

I'd like to see more and more scale activity, where static judging and flight points are made equitable. It doesn't have to be museum scale, AMA scale, or even FAI scale. Why not just a nice sport or stand-off scale? The use of plywood, spruce, fabric, and dope for the vintage machines is easily duplicated in a model, and as far as the current crop of super soarers is concerned, both the full-size and the model-size ships are fiberglass. So get busy!

In past issues of *Model Airplane News* there have been some excellent scale gliders. One that comes to mind was the magnificent effort by Steve Moskal. Heck, the plans for his Schweizer are still available (plan #4842 for $20.00, see ordering information in the *M.A.N.* full-size plans ad in this issue). To order a plans list, just send $2.00 to *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. You could build a Schweizer TG-3, or a TG-2, or maybe a nice old LK-10A (TG-4A) if, like me, you're a "vintage" nut.

There are plenty of plans sources if you know where to look. For example, Jerry Slates at Viking Models USA* has a large assortment of plans and fuselages for scale airplanes. Documentation is available from Scale Model Research*; just ask Bob Banka for what you need. Hobbypoxy* and the Black Baron line from Coverite* have a variety of colors that will match the original scale colors in many cases, and you can often get color chips from sources like the National Soaring Museum* in Elmira, New York. Books are also available, and one of the very best you'll ever find is Martin Simon's book *Vintage Sailplanes of the World, 1908-45.* This book is available only directly from Kookaburra Publications* in Australia. For the old timers, The Vintage Sailplane Association* is an excellent bet for detailed information.

Enough already? Well, okay, but please do something about it and let me know. Good black and white glossy photos are always welcome.

Along similar lines comes a tale from

(Continued on page 104)

SOARING NEWS

(Continued from page 101)

Texas, provided by a correspondent from Mesquite—who shall remain nameless just in case the Audubon Society or the SPCA wishes to prosecute! It seems that one of the local pilots was flying his sailplane when he spotted a red-tailed hawk circling in a well-defined thermal. Our intrepid pilot decided to join the hawk, but joined the circle in an opposite direction! The hawk took umbrage at this discourtesy and attacked the sailplane. The pilot, not one to shrink from mortal combat, and also being a somewhat skilled aerobatic fellow at that, joined combat. The attacks, evasions, thrusts and parries lasted for perhaps 10 minutes, with neither hawk nor pilot gaining the advantage. After the combatants had fought down to only a few hundred feet ground, the hawk tired of it all and disappeared. Our hero landed to the applause of the club members who watched the whole show. From what I understand, the hawk was not only able to match the sailplane maneuver for maneuver, but was able to do some things that the glider couldn't...like feinting with its talons!

Letters

When is a kite not a kite? David Hebden, Jakarta, Indonesia wrote about some interesting aero-towing experiences that took place *40 years* ago!

"Dear Jim: As a member of the Mauripur Aeromodelling Club whilst serving with the RAF in Karachi, I was involved in some unique—and highly successful—aero towing experiments. The model used was an 18-inch wingspan, balsa-and-tissue, scale model of the German DFS 230 Assault Glider (of Fort Eban Emael and Gran Sasso fame). Power was provided by the local breed of Pariah Kite—a fearless scavenger that would snatch food from your plate between the cookhouse and the billet.

"Operational procedure was simple; the glider was laid on the ground heading into the wind. About 12 feet of thread provided the towline, and on one end of this was a simple ring holding the glider's nose hook. On the other end was attached a piece of bacon or a rissole. All that was then necessary was to retire to the shade and wait a few minutes. Down would come one of the scavenging birds to grab the bait, and up would go the glider. The height reached depended on how long it took a rival shite-hawk (local name) to try to grab the bait from the towing bird! Any hesitation on the part of the towing bird would disengage the hook and release the glider. Some flights lasted several mintues, and some only a few seconds...but at least there was never any shortage of willing (and hungry) towers. Incidentally, these same kites were very useful thermal markers. On regular days we would wait to tow up our six-foot specials until we could hit the same thermal, but we gave up the practice when we lost two gliders in one day...which, for all I know, may still be circling around somewhere over the Sind desert!"

Until next month, happy soaring.

Jim Gray, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the sources mentioned in this article:*

Top Flite Models, Inc., 2635 S. Wabash Ave., Chicago, IL 60616.

Carl Goldberg Models, Inc., 4734 W. Chicago Ave., Chicago, IL 60651.

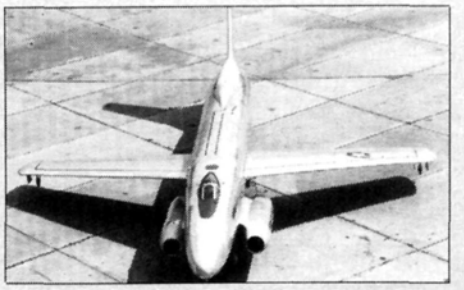
NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to Model Airplane News, Name the Plane Contest (state issue in which plane appeared), 632 Danbury Rd., Wilton, CT 06897.

Our mystery aircraft for the May 1987 issue was a Martin XB-51 that seems to be a precursor of today's T-tail jet liners. Circa 1949, the XB-51 had shapely swept wings, tandem landing gear, three jet engines (two on forward pylon mounts, one in the rear) and the aforementioned T-tail. It was delivered to the U.S. Air Force for testing as a high-speed, ground-support aircraft. The wingspan was approximately 55 feet with an overall length of 80 feet.

Congratulations to Charles Campbell of San Angelo, Texas, for correctly identifying May's mystery aircraft. Other correct entries were received from Bill Heffelfinger, Kendall Thomas, and others.



The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to Model Airplane News. If already a subscriber, the winner will receive a free one-year extension of his subscription.

Viking Models USA, 2026 Spring Lake Dr., Martinez, CA 94553.

Scale Model Research, 2334 Ticonderoga Way, Costa Mesa, CA 92626.

Hobbypoxy, Pettit Paint Co., P.O. Box 378, 36 Pine St., Rockaway, NJ 07866.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

National Soaring Museum, Harris Hill, RFD, Elmira, NY 14903.

Kookaburra Technical Publications, Pty, Ltd., P.O. Box 648, Dandenong 3175, Victoria, Australia.

The Vintage Sailplane Association, Scott Airpark, Lovettsville, VA 22080. ■

4-STROKE RALLY

(Continued from page 27)

a Bucker Jungmeister powered by the new FR5-300 Sirius five-cylinder radial engine all the way from Osaka, Japan. Naturally, it was uncowled, exposing its glorious mechanics. Mr. Mihara was no slouch when it came to flying. His contribution to the success of the rally couldn't be overstated. As a result of his interest in the event, O.S. contributed 15 engines as prizes—the 240 four-cylinder raffle engine, two 120s, two .90s, two .60s, four 40s and four .20s. The HAWKS were most grateful for his help this year and presented him with a plaque to commemorate the 50th anniversary of O.S. Engines. Mr. Mihara has expressed the desire for O.S. Engines to participate in the 1987 rally and I'm sure he'll once again be welcomed by all.

The rally's finale was an individual flying display put on by some of the contestants shortly after noon on Sunday. The DH2 went first, breaking a couple of undercarriage bracing wires with a one-wheel touchdown. This was followed by Chuck Smith of Chicago, Illinois, with his Nuttin' Special and Mr. Mihara with some great low-level flying for the video. He's quite a showman. Joe Utasi was up next with the Cessna 310P twin followed by a great aerobatic display by Miles Reed of Canton, Ohio, with his red, white, and blue Weeks Special biplane. He treated us to four-point rolls, knife-edges, consecutive rolls, and inverted flight. The final display was provided by Aerodrome Models, who, along with Cliff Tacie, flew the Aero Pacer, DH60 Gypsy Moth and Fly Baby.

Rally Chairman Jim Buzek had done such a fine job of soliciting door prizes from manufacturers that every contestant took home a bag of goodies. At the end of the rally he handed out prizes to the lucky winners, including Steve Stevenson, Jim Johnson, and Larry Miller for placing first, second and third in timed flight; Bob Hoseska for mini-pattern; Jack Beatley for old-timer; and me for standoff scale and best of show.

A few changes are planned for 1987. With less than 30% voting for best of show, the item will be dropped. This also will remove the problem of one person winning both this and scale as has happened twice now in the rally's four-year history. The scale judges will be selected from outside the club and they'll adhere strictly to AMA standoff scale rules, which hasn't always been the case. As always, there's room for improvement in flight scheduling and frequency control; and these subjects will again come under review by the committee.

And we can't wait to do it all again in '87. ■

RPM CESSNA

(Continued from page 49)

ten closer to ARF than this. To say that they've been widely accepted is an understatement. Recently, in a single day at the local flying field, nearly half the planes present were RPM and other ARFs. This situation is not unusual and I wouldn't be surprised to see this type become the majority. The ease of assembly combined with excellent flying characteristics is hard to beat. In fact, until the Cessna 40, my major complaint about the ARF lineup was the lack of a really good trainer. The available trainers were either too small for good visibility or too fast for good training characteristics. With the Cessna 40, beginners can look forward to a plane that looks and flies as well as it builds.

Since this review is for beginning fliers, it might sound overly detailed to the experienced builders. However, I really want to make clear to the first-time model builder what to expect when he opens the box.

THE KIT. Inside, I found five major components—fuselage, wing halves, rudder, and stabilizer—that were pre-built and covered with a foam and hard-plastic skin with permanent color and markings. Along with these major parts you'll find a few die-cut plywood pieces, plastic fairings, fuel tank, wheels, pushrods—even epoxy! There is a massive aluminum motor mount that will adapt to every engine possible for this plane. The only extra are the engine, radio, and fuel tubing. The only tools needed were a hobby knife, electric drill, sandpaper, screwdrivers, and sturdy pliers for bending and cutting pushrods.

ASSEMBLY. Building starts with the wing. The wing halves are held together by a sturdy plywood joiner built-up from three die-cut pieces. When they're assembled correctly, this joiner is designed to key into slots built into the root of each wing section. Unfortunately, the instructions aren't as detailed as they could be, so make sure the parts join correctly "dry" before gluing them together. Ascertain which side is the top of the wing and be sure that the wing halves bend up. This may sound basic, but I know modelers who have built the wings upside down, which only results in grief. Check the fit, do it right, and the plane goes together so quickly you'll surprise yourself.

There are a few other notes on wing assembly. There is a second balsa brace installed behind the main brace. Don't leave it out. The instructions tell you to slot the leading edge of the wing after the halves are glued. It is easier and neater to do it before they're joined. Don't be shy about using too much epoxy on the joiner. It supplies all the strength-holding the wing will require; better to use too much glue than to use too little.

Assembly of the fuselage begins with installation of the rudder and elevator pushrods. This was the only place in the kit where a part didn't fit correctly. The pushrods measured out at 25 inches tip to tip, were about 2 inches too long for easy installation. I spoke to another modeler who had the same problem. My advice is to check the supplied pushrods, and if they're too long, cut off 2 inches from the balsa part of the rod. Re-attach the wire end, make sure it is secured by wrapping it with thread and soaking the thread with glue. If you're not sure about this step, check with a more experienced modeler before proceeding.

Attaching the stab, vertical fin and rudder is straightforward and it took about 30 minutes. Once again, use plenty of glue, make sure it's holding and the parts are straight and square. There is a plywood plate glued into the fuselage that helps hold the tailfeathers to the airplane. Don't forget it. The rudder hinges are glued into the vertical fin with a few drops of epoxy. A little grease carefully applied to the hinge line is well advised here. The light plastic fairing streamlines and reinforces the cyanoacrylate to hold it together.

The wing is held to the fuselage by screws going into a plywood plate glued to the fuselage. The plate on my model was a tiny bit oversize and needed a bit of sanding. Holes must be drilled into the wing for the screws to pass through. Measure and mark the wing carefully before drilling. Add the center section fairing after the holes are drilled. This will be a neater job as all the marks you made will be hidden.

At this point the screwdriver takes over construction. The landing gear, control horns, motor and cowl must be added. Also, the fuel tank is assembled and installed. Holes must be drilled to accommodate your engine. Once again, just take your time and do it right. Save the cowl until after the motor is mounted, and make sure it centers on your motor. At this point, have a little fun and add the supplied trim and cockpit decals.

Now your plane is almost ready to go. Don't forget the radio. This may seem to be the most mysterious part. Don't worry. It's been done millions of times. Just follow Chris Chianelli's three rules for Happy Radios: *moving parts should move freely, servos should be attached firmly without compressing the mounting grommets, receivers and batteries must be packed in foam.* It always pays to follow these rules. I found it was easier to attach the servos to the plywood tray before installation in the plane. Holes must be drilled for the throttle and nose gear pushrod. The diagrams in the manual are complete and should be followed carefully. Last, but far from least, make sure the right surface moves in the right direction when you move the sticks! Don't let

anyone fly your plane until it is inspected by an experienced pilot.

FLYING. This is a good time to go out to the field and study the other pilots. How do they prepare for flight? They check their radios; make sure nothing has broken loose inside or ouside the plane; their equipment is well organized; and they don't spend much time fussing on the field. Watch the bad ones while you're at it. The planes might or might not fall apart. They love to spend most of the day adjusting faulty engines. Understand how engines start and don't be afraid to ask questions. You just might learn something helpful.

Chris Chianelli's flight report follows.

As Steve has already pointed out, this ARF is aimed directly at the rank beginner, and hit its mark it does! So far, I haven't flown a new-era ARF that has better trainer characteristics than the RPM Cessna 40. This is no doubt due in part to its decent size. In fact, this model stands up to any of the balsa trainers I've flown.

Since Steve and I plan to fly this one off water, we installed a Saito .80 four-stroke, a new engine distributed by United Products*. Along with its sister engine, the Saito .65, it's one of the most powerful engines in its class if not the most powerful. I'll get some rpm figures to you in the near future. It became obvious after the first few flights that the .65 would have been more than sufficient even for off-water use. In spite of all this power the Saito demonstrated super handling and idling qualities.

Upon taxiing, the first flaw in the Cessna arose: the wheels in the kit are good, but they need to be glued to the hubs otherwise they'll come off. After application of some Zap the plane ground-handled beautifully.

To be concise, takeoff, landing and all aspects of the flying are so rock positive that this craft rates an A+ in so far as it is for the first-time modeler.

The size of the bird, being large, affords the fledging pilot extra reaction time and smooth confidence-instilling training sessions that are so crucial to quick learning. This is the perfect entry-level model.

Entry-level or not, with that reflex semi-symmetrical airfoil, I couldn't resist clowning around. Inverted flight and other aerobatics are well within the abilities of this versatile design; note photo of inverted flight. Incidentally, if you're listening to Rich Uravitch, I wouldn't try this with your RPM Cessna just yet; for now, keep yours right side up till I can get out of your way to give you a hand. You've been doing so well thus far with this design let's not push it.

**The following are the addresses of the companies mentioned in this article:*

RPM, 5070 Golden Dr., San Jose, CA 95129.

United Model Products, 301 Holbrook Dr., Wheeling, IL 60090. ■

CONTROL TOWER

(Continued from page 40)

- Futaba low-power custom IC provides high starting torque, narrow dead band, and excellent trackability.
- Fiberglass-reinforced PBT (polybutylene terephthalate) molded servo case is mechanically strong and invulnerable to glow fuel.
- Strong, polyacetal resin, ultra-precision servo gear features smooth operation, positive neutral, and very little backlash.
- Fiberglass reinforced epoxy resin PC board with through-the-hole plating improves servo amp vibration and shock resistance.
- Thick gold-plated connector pins ensure positive contact and improve reliability against shock and vibration. The connector housing is polarized to prevent reverse insertion.
- Six special adjustable splined horns are available.

As I mentioned earlier, the transmitter is the heart or brain of the FP-8SSAP system and the airborne system does what the transmitter tells it to do, so let's take a look at this important part. The front panel is resplendent in brushed aluminum finish and chromed plastic stick bezel. The external stick structure is machined from aluminum stock and uses open gimbal construction. For those of you not familiar with single-stick transmitters, elevator and aileron control are similar to the right stick function on a two-stick transmitter but rudder is actuated by the 1-inch diameter knob on top of the single stick. Thus, the front panel is really uncluttered, and throttle control as well as rudder and aileron trim are located on the transmitter top.

Looking at the front panel starting at the upper left, we have the level meter which indicates the battery condition and output power. As there is only one needle indicator, this portrays both battery condition and output power. When the needle moves from the white zone to the red, it's time to bring your airplane down and recharge the batteries. Below the level meter are two mixing and a snap roll control. When they are activated, they will blink. Below the level indicator is the power On/Off switch which must be pulled forward and pushed up to turn on the transmitter. To the right of the level meter you have two detented trim controls for Channel 6 and 7 and below them, respectively, mixing control switches Channel 2-6 to the left and Channel 6-7 and 2. Up is On and down is Off.

(Continued on page 108)

CONTROL TOWER

Incidentally, this might be a good time to give channel identifiers: Channel 1 is aileron, channel 2 is elevator, channel 3 is throttle, channel 4 is rudder, channel 5 is landing gear, channel 6 is flaps, channel 7 is spoilers, and channel 8 is prop pitch. At the bottom of the front panel, we have the Tachometer/Timer Indicator. Using a Liquid Crystal Display (LCD) it provides the ability to read engine rpm via an accessory tacho sensor provided or afford timing functions useful in competition flying.

Moving to the top of the transmitter, we have to the left a ten-element telescoping whip antenna 42 inches long, a carrying handle and a number of controls at the rear: channel 8 prop pitch low and high trim to the left and the main throttle control to the right. In front are three switches, the two left switches are mixing controls and the right switch is the channel 5 landing gear switch. In front of the switches are two trim controls, the rudder trim to the left and the aileron trim to the right.

Moving to the right side of the transmitter and starting at the upper right, we have the elevator dual-rate switch—On is forward. Directly below the elevator D/R switch is the aileron D/R switch, which has two dual-rate (throw) positions to suit varying aircraft or maneuver requirements. To the left of the D/R switches is the elevator trim control. Below are the snap-roll direction switches (left-right, up-down) and the snap roll button to the right. Moving down is the fail-safe engage button and below to the right are the throttle trim and idle up trim associated with a variable-pitch prop if one is used. At the bottom of the right side, we find the receptacle for the training cable (not provided) and the trainer On/Off switch.

On the left side of the transmitter we have the replaceable frequency module and below that two connectors which are protected by a molded rubber plug. The top connection is for the Tachometer sensor connection and the lower is for charging the transmitter or the direct servo connector cable which allows you to exercise the servos without transmitting.

Finally we arrive at the transmitter back, remove a panel and discover over sixty controls including potentiometers, switches, and patch panels—a little mind boggling if it weren't for one of the most comprehensive instruction manuals I've come across. Forty-one pages of superbly illustrated line drawings, exploded-view and isometrics, probably the best I've seen from a radio supplier.

The Futaba FP-SSA-P is a classy radio. As a single-stick afficionado, I'm enamoured by it, but it's going to take time for me to learn to use all its features. I think the Futaba two-stick or single-stick PCM radio is a good investment for the serious R/C enthusiast, young or old, as long as he or she is going to stick with R/C, because it is a large dollar investment. But you can start without all the fancy features available, and use the system as a four-channel radio while your confidence builds. Then, start to introduce mixing or dual-rate control and grow into more advanced flying. Joining a local R/C club is a great way to get help with your flying and save a lot of models you would probably crash if by yourself.

Charlie Kenney, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Futaba Corporation of America, 555 W. Victoria St., Compton, CA 90220. ■

FLOATING

(Continued from page 97)

country, you're going to have an enormous area to take off and land from, compared to the average landing strip. For example, a one-acre pond is not hard to find. That's 43,000 square feet-plus of smooth, flat, landing area! The final reason is that, in truth, water is a more forgiving element to train over. Water loops, a snagged wing tip, nose overs and even float-shuddering rebounds are so harmless it becomes comical. You only have to take minor precautions (mostly water-proofing) to produce a plane you can dunk, shake-out, start up, and fly again, and that's hard to say about flying off of *terra firma*.

This month I have photos of both beginning and intermediate trainers. It's ladies first, and Emily Kremper is very special. I met Emily at the '86 Clearlake Float Fly. With her son Mike as a tutor, she had built and was learning to fly a

(Continued on page 111)

FLOATING

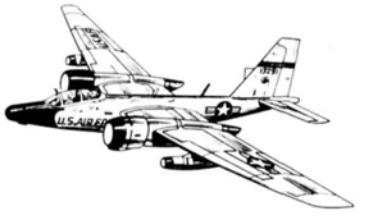
(Continued from page 109)

Goldberg Eagle 63, on floats, powered by a Fox .40. It was great to watch the two of them work together. Emily was flying, smiling, and having a great time while Mike was a bundle of nerves. They were a great team, and I hope they return in '87. Elsewhere you'll find a shot of Gary Gleffee with his ST29-powered Telemaster 66. Gary's a member of our club, the Hennessy Pontoons, and had taught himself to fly before joining us. The fact that he holds an A&P license, and has soloed full-scale, made learning to fly alone relatively easy. In the six months since this picture was taken, Gary has worked his way up through three models and is currently flying a blown-up, scratch-built, Webra .90-powered Hots on floats, so all you beginners can take heart.

The last group of planes falls into the intermediate category and isn't recommended for the absolute beginner. I felt inclined to include at least the Cubs to illustrate a point, and that is that the Cub is usually associated with slow, docile flight similar to its full-scale counterpart, and as such, modelers tend to buy the Cub for a trainer. Actually, as a model, the Cub is capable of performing a wide range of maneuvers. I would stick to the basic trainers and save planes like the Falcon, Cubs, and Cessna shown here for your second effort.

I've just received notice of the 19th annual NW R/C Seaplane Championships which is being held July 11 and 12 at the Pine Hollow Reservoir, 7 miles west of Tygh Valley, Oregon. The meet features multiple R/C Fun-Fly events with up to 50% bonus points for scale models. The $20 entry fee includes a patch, a ticket for the Saturday night barbeque, and entry in the merchandise drawing. There will be trophies for first to fifth place and a special award for the best ROW electric-powered flight. For further information, contact Dick Hanson (503) 653-2578 or Dick Heininge, Proctor Enterprises (503) 678-1300.

John Sullivan, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■



HUGHES 300

(Continued from page 46)

Installing the engine drive assembly is straightforward if using a .25 or .28 engine. A larger displacement engine such as a .40 may require cutting the crankshaft tip off as much as ⅜ inch to accommodate the clutch mechanism. Engines larger than a .30 should be considered only for high-altitude regions or if you think your 300 will exceed the average flying weight, about 4¾ pounds, by a large margin. Mounting a .40 just to have extra power at average altitudes will lead to some tough-to-handle flight characteristics.

As with all GMP kits, the tail rotor transmission is factory assembled, requiring only attachment of the blade holders and pitch mechanism. Assembly of the tail boom spacers and drive wire tube needs close attention to minimize maintenance. Mounting of the tail tube requires patience and careful measuring to insure true alignment since it is suspended at three points on the main frame. It isn't hard, it just takes a little effort.

Successful flights on any helicopter depend on positive, predictable and consistent engine performance. Model helicopters provide the worst possible environment since movement of cooling air is generally limited. Also, the engine works harder under a constant load, in which case even more heat must be dissipated. A vicious cycle. The GMP Hughes 300 employs a cooling fan and ducted shroud to provide necessary circulation. With the fan mounted, now the duct must be carefully trimmed and affixed. Proper mounting to specified clearances will allow the whole assembly to do its intended job.

Most of the main rotor head parts, at least the most critical in alignment, are pre-assembled and require only mounting of the stabilizer bar, control mechanism and blade mounting straps. Continuing down the main rotor shaft, assembly and fitting of the swashplate and related control linkages is next. The instructions are very clear and specific at this point as to set-up and alignment; and they shouldn't be ignored.

Main and tail rotor blades are preshaped and nearly finished. A light touch of sandpaper, Hot Stuff* at the blade roots for added strength and application of the provided adhesive covering completes the job. GMP selects each blade carefully to match in weight, which saves

(Continued on page 112)

HUGHES 300

(Continued from page 111)

you from applying an unsightly counterbalancing lump to one of the blades. My main blades required only one additional wrap of the trim tape to bring perfect balance; tail blades required none.

Pre-cut plywood parts are the last in the box, and so begins the cabin assembly. This step takes roughly 30 minutes to complete and, as mentioned, most radios will easily fit. Attachment of the canopy mounting blocks will require most of this time, but patience will assure proper and durable mounting. Finish with several coats of lacquer or dope and install the radio using provided hardware. Control locations and amounts of servo travel are shown on the radio installation drawing. The directions and distances shown proved to be the right amount for the entire flight envelope. Additional items such as the scale dummy fuel tanks, and horizontal and vertical fins can be completed as the model progresses and bench-flying takes place.

The final set-up is carefully covered in the last steps of the instruction manual. A pitch is constructed from a piece of piano wire to instruction dimensions and is used to set the correct main rotor pitch. Tail rotor pitch setting is outlined in the diagram and is almost correct. With all servos translating the proper control direction to the main, tail rotor, and throttle, the copter was ready to fly.

FLYING. First flights turned out to be a handful with my initial engine setup, a Circus Hobbies Webra speed .40. Thinking the 300 would be much heavier than the earlier Cricket, the larger engine was wrongly chosen. Since flying weight was only slightly more than the Cricket, the potent .40 delivered unmanageable power. Initial hovering was performed from ground level to sudden 10-foot altitudes by just breathing on the throttle stick. Deciding I wanted a helicopter and not a leaping frog, the flying session ended. Where I live is almost sea level, so those of you at similar levels should beware the use of a .40. Altitudes in the thousands will probably find the .40 very suitable.

A quick trip to the workbench for an engine swap to an available O.S.* .25FSR ABC got the 300 back at the flying field in short order. And what a difference! Now the Hughes lifted off smoothly and hovered steadily. The O.S. purred on the 25% nitro fuel blend that provided an extra boost of power. These early morning trim flights showed the 300 to be a stable performer. Extra nose weight was added, about three ounces, to eliminate backwards drift that transmitter trim couldn't correct without producing a pronounced angle on the swashplate.

The GMP Hughes 300 handles predictably if flown in a scale fashion. Smooth hovering, forward-flight figure eights, even an occasional stall turn finds this little machine a capable performer. Aerobatics is definitely out with the .25 engine because its power reserve is small. Appearance and flying are scale-like and its small size enhances the visual fun.

As the day progressed from cool morning to increasingly warm midday, the old problem inherent to fixed-pitch helicopters appeared: loss of lift due to thinning air. Increasing the main rotor pitch would have overcome the problem. A tad more horsepower that is available in a .28 or .30 would also help. My choice was to stop and plan on flying the 300 only during cool times of the day rather than constantly fiddling with blade pitch and needle valve settings. The helicopter flew very well in those conditions on that and many other mornings.

Overall, the GMP Hughes 300 offers high-quality scale helicopter modeling and flying. It is a machine that won't break the bank in costs, initially or with inevitable repairs. It certainly satisfied my desire to have a small scale-model helicopter.

**The following are the addresses of the companies mentioned in this article:*

Gorham Model Products, 23961 Craftsman Rd., Calabasas, CA 91302.

Circus Hobbies, 3132 S. Highland Dr., Las Vegas, NV 89109.

Hot Stuff: Satellite City, 659 Laguna Dr., Simi, CA 93065.

O.S. Engine: Great Planes Model Distributors Co., P.O. Box 4021, Champaign, IL 61820.

Kraft Systems Co., 450 W. California Ave., Vista, CA 92083. ■

GIANT STEPS

(Continued from page 78)

possible, provide ventilation for the fuel compartment. No electrical switches or connections should be made within the fuel compartment due to the danger of fire from a combination of fuel and electrical spark.

(Continued on page 115)

GIANT STEPS

(Continued from page 112)

Is your model equipped with a kill switch? If not it should be. Glow engines without extraneous ignition systems are not easily so equipped, but it is a simple matter to provide a kill switch for a magneto engine. *No large model should be flown without one!*

I've seen several instances where a kill switch would have saved a model. One such instance resulted from flying in cold weather. Once the engine had warmed up in the air, it would not idle low enough to permit a landing to be made. Had a kill switch been installed, it would have been a simple matter to line up for a good landing, kill the engine, and dead-stick the model onto the strip. As it turned out, the model ran out of battery before it ran out of fuel, and was destroyed when it was brought in hot.

Provision of a kill switch is a simple matter, requiring only a micro-switch and a length of wire. As shown in the sketch, a wire is run from the grounding lug of the magneto, through the switch to any convenient part of the engine block. The switch may be operated from the throttle linkage. The movement required is quite small and the most convenient way to operate the switch is by using low throttle trim. At any throttle setting from idle to full, the switch has no effect so long as the idle trim is high. At low throttle, when the trim is set back to low, the slight additional movement to the throttle linkage closes the micro-switch, the ignition is grounded out, and the engine stops.

Be careful not to run the wires for the kill switch to the radio compartment. The entire assembly can easily be mounted ahead of the firewall and that's where it should be. There's a likelihood of interference if the leads for the kill switch are taken anywhere near the receiver.

Micro-switches have three terminals, marked "NO," "NC," and "C." These designations stand for Normally Open, Normally Closed, and Common. Use the C and NO terminals with the switch in the running position. When it is transferred by low idle trim, it will close and ground out the ignition. Such switches are readily available from electronic supply houses and from such firms as Radio Shack. Look over their stock as micro-switches come in a wide variety of sizes and types. Many have an "operating arm" attached to the switch operator which can make your job of setting up your kill switch a lot easier. Some have attachment brackets as well, but all are made with small holes through them for mounting purposes. Many have one elongated hole for adjustment purposes.

Adding a kill switch to your large model can provide some additional capabilities for you and will also provide a comfortable feeling of being ready for any emergency.

See you next month when we'll talk more about safety in the air.

Dick Phillips, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

WE Technical Services, Inc., 526 Lorell Terrace, Atlanta, GA 30328.

Fiberglass Master, Route 1, Box 460, Goodview, VA 24095. ■

SMALL STEPS

(Continued from page 55)

into each. This will reduce the hub hole to 1/16-inch. If you need 3/32-inch holes, you'll have to drill the Gold-N-Rod out a 1/32-inch larger.

Speaking of Sullivan products, another problem with our small R/C models is that it's hard to fit fuel tanks in place, especially using the brass tubing which comes with many kits. It just won't take a sharp enough bend without kinking, so there's a lot of wasted space in the tank compartment just accommodating the filler and outlet lines. But 3/32-inch brass tubing, such as K&S's*, will seal just as well in the tank stopper as the 1/8-inch tubing supplied—and it allows for the use of small-diameter silicone fuel tubing which is far more flexible than the large stuff.

You can bend brass tubing without getting kinks in it quite easily with K&S's inexpensive spring kit called the Tubing Bender. Slide a spring over the tubing you want to bend, the spring will support the tube wall while you make the bend as tightly as you need it. Then you "unscrew" the spring off the tubing. I couldn't do without my Tubing Bender.

Control surface hinges are another pesky problem. There are lots of types and brands on the market, but few are suitable for small models. For instance, freedom of motion is especially vital in any control system powered by small-capacity batteries. The harder it is to move the controls, the faster the batteries run down, furnishing the extra power to

(Continued on page 117)

SMALL STEPS

(Continued from page 115)

the servos. That's why I don't care for the Easy-Hinge type of control hinge. They're easy enough to install, and strong enough for just about any size model. In fact, they're so thin they'll even fit in 1/16-inch sheet balsa if you're careful cutting the slots. But they are *stiff*! On a bigger model this might be an advantage, dampening out flutter or surface vibration. But on a little R/C model the extra force it takes to move them eats up electricity like mad from the flight batteries. I used Easy Hinges at first in my Ace Pacer, but the stiffness of the ailerons was too much. I flexed the hinges repeatedly, as the instructions called for, but it made little difference.

That's why I cut the Easy Hinges apart and used Robart's* Mini Hinge Points instead. These tiny pivoting-type hinges have essentially no friction at all. They're not hard to install, provided you line up the holes accurately. I marked the locations on both surfaces with a fine-point pencil to be sure of lateral alignment. I also took great care to drill the holes square to the hinge line for angular alignment. If either of these isn't just right, it can put a bind in one or more of the Hinge Points, adding both drag and stress.

To drill accurately-positioned holes in balsa, after trying every other alternative, I ended up using a *square* needle file to drill round holes! Balsa is so fibery that it's tough to make a twist drill behave properly in it. Inevitably, one edge of the drill point catches on a wild grain fiber and pulls the drill out of line in spite of every effort to keep it straight. Also, the flutes of the drill frequently wedge sideways against the grain, again misaligning the hole.

But a square-section needle file, twisted between your fingers or in a pin-vise, seems immune to these problems. It makes the hole where you aim it; the corners doing the cutting and the flat sides furnishing a place for the sawdust to collect. If I drill a pilot hole in balsa with a square needle file, a twist drill will usually follow it exactly if the hole needs to be enlarged more than the file will cut.

Another light, very low-drag type of hinge is the baseball-stitch "sewed" hinge. I've used this a lot since the 1940s, both on U-Control and R/C models. Aside from the time and patience it takes, this style of hinging has a further limitation. You can't trust anything but nylon or Dacron thread. I've used both cotton and polyester thread for this and had both of them snap from the flexing action. But I've never had trouble with nylon thread, or Sig's* Dacron U-Control line for ½A models.

Two readers asked about the low-cost two-channel R/C systems currently on the market. There are two things about them which I personally dislike. One is the pen-cell battery boxes they use. The other is their setup with the right stick for rudder and the left stick for elevators. Both problems can be overcome, however. It's not very difficult to install Ni-Cds to replace the troublesome multiple-spring-contact battery boxes. And learning to fly with different sticks for rudder and elevator isn't too hard either, especially if you rotate the stick assemblies 90°, which puts the elevator control on the right. I have a couple of the Cox Hobbies* Cadet R/C systems, and they're well-built, easy to modify—and come with miniature servos. Of all the two-channel sets on the market today, Cox's Cadet

(Continued on page 119)

MODEL AIRPLANE NEWS

HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory.** The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

CALIFORNIA—Los Angeles

R/C & Rubber Power planes, gliders & helicopters. Futaba, Top Flite, Goldberg, Guillows, Midwest, K&B, O.S. Max, Fox, Cox, & others. Paints, supplies, & acc. Trains, plastics, rockets, & stamps. AE, MC, Visa. Hours: Mon.-Sat. 9:30-6.

NATICK STAMPS & HOBBIES
Arco Plaza, C Level, 505 So. Flower St. 626-3339

CALIFORNIA—Torrance

R/C Airplanes, helicopters and cars. Ready to run kits. O.S., Enya, Sig, rockets, plastic models, paint tools and supplies. Open 7 days, 11-8.

THE FLYING MACHINE
24208 Crenshaw 325-6194

CALIFORNIA—Torrance/Gardenia

Your one-stop R/C shop. We try to carry it all. Major items discounted. Help and advice free. Building and bull sessions allowed on premises. Owner: John Eaton.

MODEL CENTER
2304 Redondo Beach Blvd. 327-3862

CONNECTICUT—Bristol

15 minutes from Hartford. Complete stock of R/C boats, cars, airplanes, and helicopters. Also, two-and four-cycle engines. All major items discounted. Hours: Mon., Tue., Wed., 10-7; Thu., Fri., 10-8; Sat., 10-5:30; Sun. Nov.-Jan. 1-4.

BRISTOL HOBBY CENTER
641 Farmington Ave., Rte. 6 583-7273

CONNECTICUT—Norwalk

Connecticut's leading R/C shop, 15 years experience flying and selling radio control. Over 3,500 different items in stock. Custom ordering for hard-to-find parts.

AL'S R/C SUPPLIES
54 Chesnut Hill Rd. 846-9090

FLORIDA—Ft. Myers

R/C, airplanes, boats, cars, trains, rockets, games, plastic models, paint, tools and supplies, new and used. Open daily Mon.-Fri. 10:30-6; Sat. 10:30-4.

CARL WILSON'S CLEAR TRACK LTD.
3343 Fowler St. 939-3060

FLORIDA—Orlando

When in Disney World, stop and see a complete line of R/C planes, boats, cars, rockets, and accessories.

BOB'S HOBBY CENTER, INC.
7333 Lake Underhill Rd. 277-1248

GEORGIA—Smyrna

R/C Specialists, aircraft, boats, cars, helicopters. Sig, Pilot, Futaba, Enya, Tamiya, Red Max. Hours: Mon.-Fri. 10-7; Sat. 10-5; closed Sun.

HOBBY JUNCTION
3260 South Cobb Dr. 432-2538

ILLINOIS—Chicago

Chicago's largest hobby shop. R/C planes, helicopters, boats, and cars. R/C Repairs, installations, and custom building. Mon.-Fri. 10-9; Sat. 9-6; Sun. 11-4.

STANTON HOBBY SHOP, INC.
4734 Milwaukee Ave. 283-6446

MINNESOTA—Minneapolis

R/C modelers, attn., helicopters, cars, airplanes, boats. If it moves, we R/C it! Futaba, Airtronics, Acoms, O.S., Enya, Associated, Tamiya, Kyosho. Mail orders welcome, we ship UPS daily. Mon.-Fri. 10-9, Sat. 9:30-5:30, Sun. 12-5.

HUB HOBBY CENTER
6416 Penn Ave. S 612-866-9575

NEW JERSEY—Jackson

R/C planes, boats, cars, and helicopters with extensive hardware dept. Parts and service, custom-built products, all with expert advice. Hours: Mon.-Fri. 10-8, Sat. 10-5.

JACKSON HOBBY SHOP
RD 5, Box 12, W. County Line Rd. 364-3334

NEW JERSEY—Mercerville

Complete line of planes, Robbe, Sig, Kraft, Great Planes. Large R/C selection plus trainers, boats, and all other hobby needs. Open 7 days.

IRON HORSE HOBBIES
116 Flock Rd. 586-2282

NEW JERSEY—Red Bank

Full-line hobby shop. Ask us, we will compete with mail-order prices. Mon.-Wed. 10-6, Thr. Fri. 10-8, Sat. 10-5, Sun 12-4.

HOBBYMASTERS
62 White St. 842-6020

NEW YORK—Elmsford

A complete R/C hobby shop, carrying a full line of supplies and parts for R/C airplanes, cars, and boats with 40 years R/C experience. Mon., Tue., Fri. 10-6, Thu. 10-9, Sat. 10-5.

ANDY'S HOBBY SHOP, INC.
36 E. Main St. 592-5176

NEW YORK—Kingston

Full service hobby shop: R/C aircraft, boats, cars, complete supplies and accessories. Model trains and equipment. Model rockets and supplies. Plastic kits. Mon.-Thr. 10-6, Fri. 10-9, Sat. 10-5.

J AND J's HOBBIES, INC.
37 North Front St. 338-7174

OHIO—Findlay

Findlay's local R/C dealer, planes—cars—boats. We specialize in R/C, large selection of kits, accessories, and parts. We are authorized Sig and Dremel dealers. Also sell plastic kits and model rockets. Tue. & Thu. 3-9, Mon., Wed., Fri., & Sat. 10-9.

JINX MODEL SUPPLIES
721 Rockwell Ave. 422-5589

OKLAHOMA—Tulsa

R/C Specialists, planes, helicopters, cars and boats. We also have kites, boomerangs and plastics. Experienced personnel to answer all your questions. AE, Visa, MC. Hours: Mon.-Sat. 10-6, Thurs. 10-8.

WINGS 'N THINGS HOBBY SUPPLY, INC.
5153 S. Peoria Ave. 745-0034

RHOSE ISLAND—Apponaug

Aircraft, boats, cars, U/C R/C technicians on hand till 9. All supplies carried, engineering service. Mail order specialists.

APPONAUG COLOR SHOP
1364 Greenwich Ave. 737-5506

SOUTH CAROLINA—Bishopville

Authorized dealer for Schoonard X-Cell, Graupner/Heim, Robbe and TSK. We discount kits, parts, radios, engines, and accessories. Call or write for free sales flyer. Free shipping on orders over $100.00.

THE HELICOPTER SHOP
111 S. Nettles St. 484-5214

TENNESSEE—Knoxville

10,000 items for R/C, FF, C/L, airplanes, boats, cars, helicopters, rockets, trains, tools, and supplies. Hours Mon.-Fri. 10-6, Sat. 9-5.

TENNESSEE MODEL HOBBIES
8909 Oak Ridge Hwy. 482-2900

TEXAS—Houston

R/C airplane specialists, R/C cars, boats, helicopters. Plastic models, rockets, trains, HO & N. "Toys for Big Boys." Mon.-Fri. 11-7, Sat. 10-6.

LARRY'S HOBBIES
2214 E. FM 1960 443-7373

TEXAS—San Antonio

Specializing in R/C airplanes with largest selection in southwest. Also boats, cars, helicopters, and rockets. Mon.-Fri. 10:30-6, Sat. 10-5. Since 1972.

HOBBY CENTER, INC.
3439 Fredericksburg Rd. 735-4218

UTAH—Sandy

Planes, cars, boats, trains, plastics. Complete line of tools, paints, etc. Mon.-Fri. 10-8, Sat. 10-7.

M.R.S. HOBBY SHOP
9425 Union Square 572-6082

HOBBY SHOPS: Act now and get first ad free!
Directory space is sold on a yearly basis with a choice of three payment plans: 1. $179 per year, payable in advance; 2. $97 for six months, payable in advance; or 3. $17.50 per month to be billed monthly. Space reservations must be received by the 15th of the third month preceding publication (for example, January 15th for the April issue).

Send sales message and payment to **Model Airplane News Hobby Shop Directory,** 632 Danbury Rd., Wilton, CT 06897.
For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Mary Hennessy.

SMALL STEPS

(Continued from page 117)

seems to be the best suited for our small-size R/C models.

Joe Wagner, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the manufacturers mentioned in this column:*

Flyline Models Inc., P.O. Box 2136, Fairfax, VA 22031.

Ace R/C, 116 W. 19th St., P.O. Box 511CO, Higginsville, MO 64037.

Sullivan Products, One North Haven St., P.O. Box 5166, Baltimore, MD 21224.

K&S Engineering, 6917 W. 59th St., Chicago, IL 60638.

Robart, P.O. Box 1247, 310 N. 5th St., St. Charles, IL 60174.

Sig Manufacturing Co., Inc., Montezuma, IA 50171.

Cox Hobbies, Inc., 1525 E. Warner Ave., Santa Ana, CA 92705. ■

R/C NEWS

(Continued from page 64)

After laying-in a strip of MonoKote to finish the edges of your control surfaces, install the MonoKote hinges in an alternate pattern (top of stab to bottom of elevator and vice versa). After all surfaces are hinged in this fashion, cover the flight surfaces in the normal fashion. The result is a near invisible hinge that also closes the flight surface gap to any air that might flow through. These MonoKote hinges stand up to as much as .60 power.

All hinge installation requires slots or holes (except the MonoKote) that are on the center line of each hinged surface. There are devices to help with this, but a simple center line drawn on each surface is sufficient. In any event, keep each hinge as close to the center line as possible—any misalignment can cause binding. This binding is a common hinge problem

(Continued on page 121)

R/C NEWS

(Continued from page 119)

and ignoring it can cause premature failure due to unwanted flexing.

It is also important that all hinge lines be closed as much as possible. All pin styles require some inset wood removal to close the surfaces together. Likewise, the moving surfaces (aileron, elevator or rudder) must have a V or rounded leading edge. The big advantage of MonoKote hinges is the removal of any air leakage when in flight. When the hinge line is properly sealed, it is surprising how little throw is needed for control.

Years ago, I was flying a Pulsar biplane that had very tight surfaces. The rolls were crisp, yet not quite what I wanted. On suggestion, I sealed the minimal gap on the ailerons using vinyl electrical tape. Wow! The airplane turned into a tiger, because the ailerons became at least twice as effective. I finally flew that airplane with less than one-half its original surface movement.

Keep in mind that hinges are as important as the radio signals—without solid connection of both, there can be serious consequences.

Working Tips

MonoKote has become a modeling staple and most of us get credible results from using it. But there is always something to learn, as evidenced by this tip sheet from *Radio Waves* of the Sierra Madre Radio Control Modelers:

Always cut over glass. If you cut over wood, even with a metal straight-edge, the blade will wiggle. This will give you a wavy line, though you may not see it with the naked eye. Later, when you iron the edges, you'll get smears because of this wavy line. So use glass instead.

Alway cut MonoKote with the glue side down. This leaves all edges bent down and makes for better adhesion and cleaner seams.

Always leave a handful of material around the edges, especially when you're going to have to go around curves. You need plenty to grab on to.

When ironing over previously applied MonoKote, turn your iron down to "2" for the top layer. If the top layer is a large area, use your MonoKote sticker to puncture the area below it.

When ironing over solid surfaces, iron from the middle to the edges. You can also use your MonoKote sticker on bare balsa.

Use Aero Gloss thinner, or the equivalent, and paper towels to clean smudges when covering with different colors. But wait until the MonoKote has cooled.

Take your time and the results will be worth the effort and time spent.

Art Schroeder, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897. ■

PATTERN

(Continued from page 58)

Fly, Dash, Aurora, Atlanta, Blue Angel, Citation, and a host of others. The quality of his aircraft is superb in both craftsmanship and finish.

Get this—Gene says that his company will build almost any aircraft from any kit to your specifications for radio and engine setup, including tuned pipe and header! Now that's custom aircraft making. Contact Ten Plus Company directly if you're interested and tell them we gave you the tip.

PIC Coating Epoxy

I've recently tried a new product on the market from Penn International Chemicals*. It's the PIC Coating Epoxy, a two-

PATTERN

part epoxy resin for laminating and coating aircraft surfaces. The adhesive is mixed in ratios of 5 to 1 and has a working time of 1½ hours before curing. This resin has proven to be great for fiberglass cloth applications as well as general surfaces prior to painting.

I used the PIC Coating Epoxy in a recent project with the Craft-Air* Checkmate pattern bird with good effects. It applies well with a brush or squeegee, and spreads evenly. My work involved wing reinforcement using fiberglass cloth and carbon-fiber strands. The resin is compatible with foam and existing fiberglass parts. The result was a nicely completed center section that was very strong and really easy to work with. It can be used to finish foam cores directly without attacking the cores. If this sounds like something for you, then ask for it from your local hobby shop.

Tech-Talk

Our tech-talk this month focuses in on the use of the rudder in rolling maneuvers. Many pilots going through the learning game of precision maneuvering have trouble using the rudder effectively. Consequently, their maneuvers appear jerky and a lot of heading is lost. The effective use of the rudder not only makes the maneuvers look better, but also makes overall fine control of the aircraft easier.

Most of us learn piloting with twin controls of ailerons and elevator for 90% of our apprenticeship. We usually ignore the left-side stick except for making the engine change speeds. The other 10% was used to taxi out or back. Once we learned the ailerons, who needed the rudder? Well, when it comes time to performing sharp maneuvers, the learning game starts all over again. Certainly, the most obvious place where we show our learning skills, or lack thereof, is in the point and slow rolls.

It's here we see the ship punching its way to show center and nicely beginning to roll to the right for the first of our four points. As the ship reaches the first point, the tail suddenly cocks sharply downward as the pilot hits the rudder. It continues to show as the plane begins the second point and the pilot allows the rudder stick to snap toward center. You guessed it, the plane flops the tail all over the place looking as if it's been hit in the rear with a load of buckshot.

The cure for this affliction is very simple. It's called awareness. We're not really aware of our flopping movements until someone points them out to us, then we feel kind of embarrassed. But to make things look better, you've got to be aware of what you're doing to the rudder stick.

First off, are you hitting the stick instead of moving it smoothly? The plane only needs a certain amount of rudder to hold the knife-edge through the point; some planes a bit more than others. That's something each pilot must determine on his own. The pilot must learn to arrive at that point at the right time.

In arriving at the right time, you've got to know how fast you're going to roll into the first point of the point roll. If it takes 1.5 seconds to get the first point, then the rudder movement should take the same amount of time. The rudder is fed into the point *gradually*. This allows the point to look smooth without losing altitude. The same holds true of the exit from the point. The rudder must be fed out *gradually*. In essence, the folks watching the maneuver shouldn't be able to tell whether you're using the rudder or not. The tail shouldn't wag or flop at all. Just a nice, smooth roll into the point, hold for a second, then roll right on out smoothly.

This technique also applies to the stall turns and spins. A stall turn should look like a turn and not like a kinked pivot. Application of the rudder at the top of the stall turn should be gradual to the point that the ship appears to rotate right around the wing tip. The ship may wag its tail on the way out of the maneuver—characteristic of a true stall at the top—but entry should be smoothly executed.

Spins are the same thing. A ship shouldn't snap into the spin. Application of hard rudder will make it look this way. Judges will hit you hard for this as they consider this entry a snap-roll entry rather than a stalled entry from level. The ship should fall into the spin smoothly. Try it and see what happens.

Remember, be aware of the rudder while you're flying. Never take your fingers off the sticks. Concentrate on applying that rudder gradually and deliberately and you'll be amazed at how much you can polish up that pattern when you're paying attention to the rudder.

Mike Lee c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

The following are the addresses of the companies mentioned in this article:

Hobby Shack, 18480 Bandilier Circle, Dept. HMO17, Fountain Valley, CA 92728.

Ten Plus Company, 3333 E. 59th St., Long Beach, CA 90805.

Penn International Chemicals, 943 Stierlin Rd., Mountain View, CA 94043.

Craft-Air, 6860 Canby Ave., No. 120, Reseda, CA 91335. ■

Classified

RAZOR BLADES: Single-edge industrial quality, super sharp. 100/$4.75, 200/$9.50, 300/$14.25, 500/$23.50, 1,000/$46.00; add 10% postage west of the Mississippi. Cobbie's Gifts, Box 2, Deal, NJ 07723; 201-922-9898.

WANTED: RTF U-Control planes from Cox, Wen-Mac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

ANTIQUE MODEL IGNITION ENGINES—PARTS CATALOG, 50 pages, precision cast timers, original cylinder heads, point sets, drive washers, tanks, for GHQ, O&R, O.K., many others. Large catalog $4.00 pp. Chris Rossbach, RD 1, Queensboro Manor, Gloversville, NY 12078.

HARDWARE AND SOCKET HEAD cap screws, all sizes, low prices. Write for complete list. Example 6-32x1" only $4.25 per hundred. Micro Fasteners, P.O. Box 42A, Netcong, NJ 07857.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; 918-245-3649.

BEGINNERS, discouraged by too-fast R/C "trainers"? Send $1 and a stamp for no-holds-barred evaluation of over 20 well-known models rated for their ease-of-flying. James Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

PRIVATE COLLECTION: Hundreds of aviation magazines for sale—*Popular Aviation, Flying, Model Airplane News, Air Trails, RAF Flying Review, Wings,* and many others. 1932-1960. All in excellent condition. Send $2 for list. William C. Fort Jr., 4161 Robin Hood Rd., Jacksonville, FL 32210.

SCALE DOCUMENTATION: PLAN ENLARGING. Photo packs, 3-views, drawings for 1,600 aircraft. Super-scale R/C plans for Giant, Sport; 43-page catalog $3. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; 919-292-5239.

JETEX ITEMS AND KIT WANTED for cash. Kits by such makers as American Telasco, Berkeley, Comet, Cleveland, Monogram, Tailored, and others. Paul Williamson, 5032 S. Ridgeview, Nashville, TN 37220.

HARRY HIGLEY BOOKS: *There Are No Secrets*—on finishing model aircraft, including paints, adhesives, heat-shrink plastics, shaping, sanding, priming, etc. *Harry's Handbook for Miniature Engines*—from basic theory, components, and fuel to break-in, repair, and new developments. *Master Modeling*—explains drawing plans, how to scratch-build, use plastics, foam, fiberglass, balsa, and plywood. *Tom's Techniques*—from Tom Ingram, in collaboration with Higley, applying plastic film, covering wings, fuselages, Horner wing tip fillets, etc. Hundreds of photos. All books are $10.95 each, plus $1.50 postage each. *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

NYLON MACHINE SCREWS, nylon wire ties, reusable polyetylene glue guns. Nylon hex nuts, cap nuts, wing nuts, washers. Nylon hex head cap screws. Domestic and metric. Quantity discounts. Free catalog. Transmotions Inc., P.O. Box 160, Dept. M, N. Hollywood, CA 91603-0160.

ENGINE COLLECTORS: Spark ignition and old diesels for sale. Riccardo Taccani, CP59, 6834 Morbio INF Switzerland.

WANTED: *Flying Aces, Model Airplane News, Air Trails,* 1920s-1950s. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

AERO CLUB OF ISRAEL needs your support for aeromodeling activities. Send SASE for Newsletter. Friends of the Aero Club of Israel, 147-02C 29th Ave., Flushing, NY 11354.

AIRCRAFT RESEARCH: Need rare aircraft documentation, photos, three-views? Send requests with $1.50 U.S. for sample information. Mr. I.A. Ross, 1447 Helm Crt., Mississauga, Ontario, Canada L5J 3G3.

MAGAZINE COLLECTION: *Model Airplane News, Flying Aces, Air Trails, Popular Aviation,* etc. 1932-1960. Comprehensive lists, individually priced with collector condition rating for $4. Dick Hill, 8826 John Dower Rd. S.W., Tacoma, WA 98499.

BUILDING BOARD: Flat, warp resistant, pinnable surface, 16"W, 48"L. Free brochure. Limestone Enterprises, Box 586-MA, Athens, AL 35611.

ELECTRIC KITS & EQUIPMENT. Specializing in Astro Flight systems. Catalog $1. CS Flight Systems, 31 Perry St., Middleboro, MA 02346-3117.

WANTED: 1930s Ideal Model kits of Boeing P-26, Curtiss Goshawk. Models had movable stick, rudder, and control surfaces. Robert L. Washburn, 3205 Landsdowne Dr., Wilmington, DE 19810.

MODEL ENGINES: IGNITION, GLOW. Collectors, runners, used, new. Sell, trade, buy. SASE for list. Rob Eierman, 504 Las Poses, Ridgecrest, CA 93555; 619-375-5537.

BE A PROFESSIONAL PILOT. Save money and train in Florida. Complete 5-month course. Guaranteed employment. $20,200 reduced to $16,200. Call Shields Aviation, 904-641-5712.

WANTED: Will pay—plans, building/flying experience, etc., Cessna Skymaster about 1/3-scale. R.C. "Doc" Gulvin, 99 Pearl St., Frewsburg, NY 14738.

SITKA SPRUCE STRIPS: 36 to 72 inches. Send SASE for price list. Art Bigelow, Box 219, Fernwood, ID 83830; 208-245-2286.

WANTED: Stinson Tri-Motor plastic airplane kit. Other old plastic or balsa kits. William Graves, 540 Skyline Dr., Fort Collins, CO 80521.

NOW USE REMOTE CONTROL IN MODEL ROCKETS. Plans and instructions $4.95. Signal Systems, Box 11503, Dept. A, Green Bay, WI 54307.

CATALOG of electric airplane kits and supplies. Send $1 to Airmen's Supply Co., Box 1593, Norfolk, NE 68701.

Send ad and payment to *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

Non-Commercial classified ads (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each.

Commercial classified ads (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.). Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number.

Closing Date for either type of ad is the 15th of the third preceding month (for example, January 15th for the April issue). We do not furnish box numbers. If you would like your ad to run in more than one issue, multiply amount of payment by number of months that ad is to run.

It is not our policy to send sample copies or tear sheets.

ADVERTISERS INDEX
JULY 1987